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„The empathy-altruism hypothesis in autism“

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Martin Almhofer, BSc

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Betreut von:	Giorgia Silani, PhD

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Ein besonderer Dank geht an die Teilnehmenden der Studie und insbesondere an die autistischen. Viele von ihnen haben gemeint, sie haben teilgenommen, damit wir mit diesen Daten Erkenntnisse gewinnen, die anderen Betroffenen helfen können. In dieser Aussage alleine zeigt sich schon, dass diese Personen gerne helfen und nicht so egozentrisch handeln, wie das oft vermutet wird. Eine große Unterstützung waren auch einige Organisationen, die geholfen haben, den Kontakt zu den Teilnehmenden herzustellen.

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1. Introduction

In 1943 Leo Kanner published an article about 11 children who had some fascinating peculiarities in common (Kanner, 1943). Although some of the children were well developed in respect to intellectual or language skills, they all were not interested in their social environment. Eight of these children developed the ability to speak, but none of them used language for the aim of communication. They repeated some phrases just for the aim of the repetition itself.

One year later, Hans Asperger (1944) published as well a description of different children, which he called “autistic”. All of these children were able to speak. But again, the aim of this conversation was not to interact with someone else. He reported that some of these children had special skills or special interests, which would not be expected at the given age. Because the children were able to speak and had some kind of special skills, the parents were not worried about their children. The problems came up, when the children had to go to school. They were offended by other pupils, because of ignoring social rules. It was not possible for them to fit into the group.

Leo Kanner as well as Hans Asperger used the term “autistic” to describe children which are self-sufficient and not capable to adjust to their social environment. Beside of an account of cognitive skills, both also mentioned, that they differed in their affect. The children had problems to understand their own feelings as well as the feelings of other people. It was also reported, that they had unusual strong tantrums for unknown reasons.

The emotional aspects of autism are still an important field of research and therefore this work tried to gain insights into these aspects. Especially empathy, distress and their relationships to pro-social behavior were analysed.

1.1 State of the art in autism research

Since this time, the number of publications related to autism became bigger from year to year. According to the Office of Autism Research Coordination (OARC,

2012) there was a 12-fold growth in the annual publication output in the time between 1980 and 2009.

Also compared to other related research subject, there is a bigger increase in autism studies. There are different categories of studies. Some try to find better ways to do diagnosis or to improve treatments. Others are looking for risk factors, lifespan issues, or they try to find out which services are needed. Most effort is done, to gain knowledge about how autism works. This includes biological as well as cognitive studies. The second biggest field is research on treatment effects and evaluation of interventions.

Research on autism is done to improve the support for affected people. By getting more knowledge about autism, professionals are able to improve their services. Also the public can be informed about why autistic people behave different. In turn this could reduce misunderstandings. In the last years, many newspapers reported about IT-companies they employ autistic people by purpose, because they are the best in tasks that require to be focused on details. This shows that changing the public opinion about autism could help autistic people to find a place in the society. And the society could benefit from the special skills of autistic people.

Treatment evaluation helps to find out which kind of therapy is helpful and also which one is not. Also parents of children with autism like to know more about their children. Knowing that their child is within the autistic spectrum helps them to change their way of parenting.

Scientists found a worldwide accepted definition for autism (American Psychiatric Association, 2013) and created tools to do diagnosis in accordance with this definition (Lord et al., 1989). Because of a wide range of symptoms, autism is defined within a spectrum. People within this spectrum are classified as having an autism spectrum disorder (ASD).

1.2 The autistic spectrum

The core features of autism are deficits in social communication and social interaction as well as restricted, repetitive behavior, interests and activities

(American Psychiatric Association, 2013). These features build the basis for a diagnosis of ASD. Problems in social interaction and communication can be explained through a deficit in theory of mind, as we will see later (for a review see Frith, 2001). Repetitive and stereotyped behaviors could be due to a weak central coherence. Such a deficit makes it difficult to process incoming information for meaning and global impression (Happé & Frith, 2006). Many studies confirmed more detail-focused information processing in people with ASD (for a review see Happé, 1999).

1.3 Other characteristics discussed

Beside from this core features, there is evidence for some other characteristics, like a deficit in executive functions (Russell, Jarrold & Hood, 1999), more alexithymia (Silani et al., 2008; Hill, Berthoz & Frith, 2004) and less self-reported empathy (Baron-Cohen & Wheelwright, 2004). Although these characteristics are not used as criteria for diagnosis, they are frequently discussed in literature. This work tries to gain insight about the deficit of self-reported empathy in ASD and its consequences on a behavioral level. Especially the relationship between empathy and pro-social behavior will be in focus.

1.4 Social cognition and ASD

Research on ASD can help affected people and professionals. But also it helps us to understand social cognition itself. Scientists are fascinated by the fact that there are people who are sometimes highly intelligent, but they can't predict other people's behavior. This implies that social understanding could be independent from intelligence. Already Leo Kanner (1943) mentioned that the children he described had problems to tell about them self's in the first person (like "I am doing something"). Instead of, they used the sentence in the way they heard it from the others (like "I give you something to eat", when they are hungry). The work of Kanner was not at all a quantitative one. But he described this kind of difficulty many times. It was already evident that this children had a problem with distinguishing the own perspective from the one of the others. A skill, that we call nowadays theory of mind.

1.4.1 Theory of mind

Premack and Woodruff (1978) described theory of mind as follows:

> An individual has a theory of mind if he imputes mental states to himself and others. A system of inferences of this kind is properly viewed as a theory because such sates are not directly observable, and the system can be used to make predictions about the behavior of others. (p. 115)

Baron-Cohen, Leslie and Frith (1985) tried to find out whether there is a lack of theory of mind in children with autism. They also liked to know if such a lack is due to a specific impairment or if it is due to a general level of mental retardation. A test to measure the ability to build representations of others mental states was used. This test was developed by Wimmer and Perner (1983). To pass the test, a false belief of another person (since the test if for children, a doll is used) has to be considered to predict the behavior of this person. In a procedure with a true belief the child could predict the behavior in accordance with his or her own belief about reality and hence it would not be clear whether the decision is based on the other person's belief.

In this usually called "Sally-Anne task", there are two doll protagonists (Sally and Anne). After Sally placed a marble into a basket, she left the scene. The marble was than hidden in a box by Anne. When Sally returned, the experimenter asked the children where Sally is going to look for the marble. If the child thinks, that Sally looks in the box, the child is not capable to understand, that Sally has a different belief about where the marble really is (false belief). Just if the child answers, that Sally looks in the basket (where the marble was before it was changed) it is most likely, that the child considers that Sally has a different mental state.

With control questions it can be checked that the child understood the sequence of events (Where is the chocolate really? Where was the chocolate at the beginning?). When this questions can be answered correctly (but the child failed in the task itself), it can be considered that the only thing the child did not understand was that one of the dolls had another mental state as the other.

This procedure was applied to children with ASD, children with Down's syndrome and clinically normal preschool children. Although the mean mental age of the autistic children was higher, they failed in this task highly significant more often than children with Down's syndrome (and clinically normal preschool children). Children with Down's syndrome were even as good as clinically normal children. These results led Baron-Cohen et al. (1985) to the conclusion, that the deficit in theory of mind in children with ASD is not just due to a general impairment. It is a special deficit in children with ASD.

These results confirm the assumption, that children with ASD do not have a theory of mind. But there is also the possibility that children with ASD have bigger problems in understanding the given question ("Where will Sally look for her marble?"). Because of this doubts, Reed and Peterson (1990) tried to replicate the results with the same procedure. This time, they included a perceptual (visual) perspective-taking task, which also requires answering similar questions, than in the Sally-Anne task. With this procedure it can be ruled out that failing the Sally-Anne task is just due to poor language comprehension.

For the visual perspective-taking task a turntable was placed on a table and an object was placed on it. The child was then instructed to turn the turntable so that the instructor could see a particular body part of the item placed on the turntable. Also in this study, the children with ASD failed significantly more often than the other groups (normal and mentally retarded subjects) in the Sally-Anne task. But the same autistic subjects were as good in the visual perspective-taking task as the other groups. These results give rise to the assumption that it is not just a lack of language comprehension, which makes the autistic subjects failing in the Sally-Anne task procedure. If the difficulties in the Sally-Anne task would be due to poor language comprehensions, difficulties should also occur in the visual perspective-taking task.

1.4.2 Development of theory of mind in children with and without ASD

There are always some children with ASD who pass the Sally-Anne task. This may imply that it is possible for children with ASD to acquire a theory of mind. In that case it might be possible to train this ability.

Children without ASD can understand and explain the Sally-Anne task not before the age of 4 years (Singer, 2006). Happé (1995) tried to predict the passing in theory of mind tasks by real age as well as by the level of mental age. The mental age was measured with a language test, which gave also an age equivalent. Also in this study, there were children with ASD, who passed the two theory of mind tasks which were applied. Verbal mental age was a significant predictor for passing both tasks (in normal and the autistic group). But children with ASD needed a much higher verbal mental age as normal children. While normal children hat a probability of 50 % for passing both tasks at a verbal mental age of 4 years, children with ASD had this probability at a verbal mental age of 9 years and 2 months. Happé tried to find explanations for these findings. One could be that people with ASD are able to find compensatory strategies to solve this task. Maybe they need much more concentration, while normal developed children can give the right answer without even thinking too much about it.

Mentalizing system is the term that Frith and Frith (2003) used for having implicit attributions of intentions and other mental states. They argue that the ability to react reflexively to movement of gaze could be innate and that at a age of nine months a child is able to understand intentions of others. At the age of 18 months, children start to look at a target that an adult is looking at also if this target is not in line of vision. This indicates that children are aware of the fact that different people can pay attention to different things (at least implicit). From age 3 years on, children becoming more confident in knowing the difference between mental states as ideas, wishes and thoughts and what happens in the real world. And as already mentioned, at the age of 4 they have a good chance to pass the Sally-Anne task.

1.4.3 How Theory of mind effects communication

Solving the Sally-Anne task is not the only and for sure not the most complex way to apply mentalization (but it is a procedure that can be applied in the laboratory). Healthy people usually reflect many times a day about their own way of thinking and about what other people could think. Without this skill, communication becomes difficult as it is for people with ASD. For understanding another person, it is not enough to analyse the meaning of every single spoken word. We also have

to consider the intention of the person who speaks. For a better understanding an example shall be given:

At a train station a stranger is asked: "Do you know what time the train arrives?" A person without theory of mind (like people with ASD) would maybe just answer "Yes" without telling the other person the time. The answer would be right, but does not help the other person. The other person maybe would even become angry. We also have to consider the intention of the other person for telling what is really asked. We would have to consider, that this person is at a train station and maybe likes to take the next train. We would have to consider, that this person does not know the schedule of the train. This example may sound simple, but without mentalizing the easiest form of interaction becomes difficult.

We could also say that without mentalizing the behavior of others becomes unpredictable and senseless. And that could be the reason why people with ASD don't pay much attention to others. Without knowing the intentions of others, their behavior becomes boring or even scary.

1.4.4 Empathy

Beside from theory of mind, there is also an emotional component which helps us to understand mental states of others by sharing the same feeling (Bird et al., 2010). This ability is called empathy. De Vignemont and Singer (2006) defined empathy as follows:

> "There is empathy if: (i) one is in an affective state; (ii) this state is isomorphic to another person's affective state; (iii) this state is elicited by the observation or imagination of another person's affective state; (iv) one knows that the other person is the source of one's own affective state" (p. 435).

This definition is not much different form the one of Stotland (1969) who defines empathy as "It is an observer's reacting emotionally because he perceives that another is experiencing or is about to experience an emotion" (p. 272). This definition is nearly 40 years older and the only big difference is, that the new definition emphasizes the isomorphic character of the emotional reaction.

This isomorphic character makes us suffer when another person is in need. Since people usually try to avoid negative feelings, there is the question about evolutionary aspects of empathy. De Vignemont and Singer (2006) mentioned that empathy helps us to make faster and better predictions of other people's needs and actions. They also claim that it has a crucial role in human communication. And as we will see, that it is associated with pro-social behavior (Batson & Shaw, 1991).

The two concepts (theory of mind and empathy) are linked to each other, but there is also clear evidence, that they work independent from each other. These conclusions come from studies with questionnaires as well as from biological studies with functional magnetic resonance imaging (fMRI).

1.4.5 The interpersonal reactivity index (IRI)

Davis (1980) created a questionnaire to measure different aspects of empathy. This questionnaire named interpersonal reactivity index (IRI) allows measuring the individual variations in perspective-taking tendencies as well as individual differences in emotional reactivity. The final result of this work is a questionnaire with four scales (emphatic concern, perspective-taking, fantasy and personal distress). Factor analysis revealed these four scales for men as well as for females with high reliability for all the scales. There are correlations between the four subscales. Nevertheless, factor analysis gives strong evidence, that there are also strong differences between the four concepts. The correlation between perspective-taking and emphatic concern is .33 for male and .30. for females. Between emphatic concern and personal distress the correlation is .11 for males and .01 for females.

These results confirmed the opinion of Davis (1980), that there is a need to separate the components of empathy for doing research. The IRI is a well-established instrument for measuring empathy and its components and was applied many times for this sort of research.

1.4.6 Empathy and biology

Beside from studies with questionnaires, there is also evidence from biological studies, that perspective-taking and empathy are different concepts. Different brain regions are involved for the two domains. Research on empathy can be done with an empathy-for-pain paradigm. Knowing that a close person suffers from pain should induce empathy in the observer.

Singer et al. (2004) exposed couples to pain while being scanned with fMRI. They placed an electrode on the right hand, to apply a painful stimulus. Both of the couples had to experience this pain. The brain activities were assessed just in the female partner. It was indicated, which of the two persons had to experience the pain. The brain reaction of the female partner was measured in both cases. With this method, the brain reaction for a painful experience and for an empathic experience could be compared.

Bilateral anterior insula (AI), rostral anterior cingulate cortex (ACC), brainstem and the cerebellum were active while knowing that the partner had to experience pain. These brain circuits are also activated when we are in pain ourselves. AI and ACC were also positively correlated with individual differences in empathy questionnaires.

Different brain regions are responsible for perspective-taking or mentalizing. While taking into account another person’s state, the medial prefrontal cortex (MPFC), the temporal poles and the posterior superior temporal sulcus (STS) are involved (Frith and Frith, 2003; Singer, 2006). These results suggest that empathy is distinct from mentalizing. Empathy can be experienced also without theory of mind.

1.5 Alexithymia

Another component, which could influence the emphatic response is the capability of understanding one's own feelings. Singer and Lamm (2009) mentioned that the same brain regions (anterior insula and anterior cingulate cortex) are involved in experiencing empathy for pain as well as for experiencing internal bodily states

(e.g. information about temperature, lust, hunger and arousal). Subjective representations of our own feelings are created in these brain regions. Since the same brain regions are involved in this two kind of functions, it could be, that a deficit in one function affects also the other. A lack of empathy could also be the consequence of a problem in understanding one's own emotions. An inability to identify, distinguish and describe own's own feelings is called alexithymia.

Franz et al. (2008) described alexithymia as a deficit in decoding the meaning of affective signals, impaired linguistic affect symbolization, a cognitive style preferentially oriented toward external facts, a poor fantasy life, and a disturbed emotional exchange within close relationships. Franz also claims that alexithymia is associated with a couple of psychological impairments like: somatoform disorders, depression, eating disorders and as well autism. Hill et al. (2004) as well as Silani et al. (2008) confirmed that there is more alexithymia in people with ASD.

1.6 Alexithymia and empathy

Much is known about the mentalizing deficits of people with ASD. Less is known about their ability of experiencing their own bodily and emotional states. A study done by Silani et al. (2008) tried to fill the gap. An introspection task was applied on people with ASD and controls while scanned with fMRI. Participants had to rate pictures according to the degree of how pleasant or unpleasant they experienced these pictures (internal task). For the external task, they had to indicate the ratio of black and white colored pixels in the pictures. Alexithymia as well as empathy was measured with questionnaires. With this task it was possible to see what happens in the brain while reflecting on own emotions. High (negative) correlations between empathy and alexithymia scales were found in both groups (ASD and controls). On a neural level, these questionnaires correlated both significantly with activity in mid-anterior insular bilaterally (while performing the internal task with negative associated picture) in both groups. Just in the autism group they were also correlated with activity in the left amygdala. In contrast, the two questionnaires did not correlate with the mentalizing regions (e.g. MPFC).

These results suggest that representations of bodily and emotional states as well as representations of another's emotional states (empathy) are not related to

mentalizing. In that case a deficit in mentalizing, as it is known in people with ASD, would not imply a deficit in empathy at the same time.

The high correlation between empathy and alexithymia and as well with activities in anterior insula could mean, that a lack in empathy is due to a lack in understanding one's own emotional states. To provide evidence for this assumption, another study was done by Bird et al. (2010). In this study empathy was induced in people with ASD and controls and brain activities were measured with fMRI. Empathy and alexithymia were measured additionally with questionnaires.

An empathy-for-pain paradigm was used to induce empathy in both groups. The control group was matched by questionnaire scores of alexithymia. This was done to find out to what extent the lack of empathy in people with ASD is due to alexithymia. After matching the two groups, there was no significant difference in the amount of self-reported alexithymia as well as for self-reported empathy. As in the previous study of Silani et al. (2008), a significant negative correlation was found between scores on the alexithymia questionnaire and scores on the empathy questionnaire.

The emphatic reaction in the brain was analysed by comparing the condition in which high pain was applied to the other person with the condition in which low pain was applied to the other person. This comparison revealed a negative correlation between self-reported degree of alexithymia and activity in the left anterior insula in both groups. After controlling for alexithymia, there was no difference in empathic brain activity between the two groups. These results provide strong evidence for the assumption that a deficit in empathy in people with ASD (if there is such a deficit) could be due to a lack of understanding their own emotions (alexithymia).

1.7 Empathy and pro-social behavior

A lack of empathy in people with ASD should also have consequences on behavior and especially pro-social behavior. Empathy towards another person should make people help this person in need. This assumption is the core of the “empathy-altruism hypothesis” (Batson & Shaw, 1991). Many studies confirmed this

relationship between empathy and helping. Significant correlations between empathy and pro-social behavior were found (Maner et al., 2002) and also in a different culture (Lee & Chang, 2007). Empathy also predicts helping in regression analysis (Coke, Batson & McDavis, 1978; Dickert, Sagara & Slovic, 2011; Verhaert & Van den Poel, 2011).

There is also a way to induce empathy in an experimental setting. Perspective-taking is used to increase empathy. Empathy can be studied systematically with this procedure. Participants are instructed to imagine how they would feel if they would be the person in need (e.g. a person experiencing pain). Already Stotland (1969) used perspective-taking instructions to induce empathy. He measured physiological arousal (assessed by vasoconstriction and palmar sweat) when participants had to watch another person experiencing pain. This empathy-arousing situation was combined with the following three forms of perspective-taking (the original text of the instructions is longer):

- Imagine-Self Condition: “Imagine how you would feel if you were the person”
- Imagine-Him Condition: “Imagine how the person feels”
- Watch-Him Condition: “Watch exactly what the person does”

The participants in the two imagine conditions showed more physiological arousal and reported also more emotions than in the watch condition. This study does not tell anything about empathy and pro-social behavior. But it shows that empathy can be induced (or increased) by different forms of instructions. The conclusions out of studies that worked with perspective-taking could be used to prove the “empathy-altruism hypothesis”. Empathy was induced with perspective-taking to see if it improves the willingness to help a person in need.

The two instructions used by Batson et al. (1997b) are illustrated as follows:

Perspective-taking (high empathy) instruction while listening to a radio tape:

> Try to imagine how the person being interviewed feels about what has happened and how it has affected his or her life. Try not to concern yourself

> with attending to all the information presented. Just concentrate on trying to imagine how the person interviewed in the broadcast feels. (p. 499)

No perspective-taking (low empathy) instruction while listening to a radio tape:

> Try to be as objective as possible about what has happened to the person interviewed and how it has affected his or her life. To remain objective, do not let yourself get caught up in imagining what this person has been through and how he or she feels as a result. Just try to remain detached as you listen to the broadcast. (p. 499)

People had to listen to a radio tap with a story of a student who has lost her parents at a car accident. One group got the instruction with perspective-taking and the other one without. The group with perspective-taking was more willing to help the student when asked for. Also more empathy was reported in the perspective-taking condition.

This instruction (or a similar one) was used in many other studies in which the instruction had effects on empathy as well as on pro-social behavior (Maner et al., 2002; Basil, Ridgway & Basil, 2008; Coke et al., 1978).

The discussion about the “empathy-altruism hypothesis” is still going on. There is no doubt that there is a relationship between empathy and helping. But some authors claim that empathy is mediated by so called non-altruistic factors. Maner et al. (2002) argues that perceived similarities with the victim and not empathy is responsible for helping. And Basil et al. (2008) found that empathy was fully mediated by guilt.

Whether or not empathy can be seen as an argument for altruism does not influence the nature of this feeling. It is other-oriented (Davis, 1980), it drives people to help (e.g., Batson et al., 1997b) and activates the same brain regions that are responsible for the affective component of pain (Singer & Lamm, 2009).

Much research was done to study the relationship between empathy and pro-social behavior. It is a chance to use this knowledge to find out more about empathy in

ASD. In this work, the methods that are used to study pro-social behavior were used to gain knowledge about empathy in ASD.

1.8 Empathy versus Distress

As described above, there is a negative correlation between alexithymia and empathy (Silani et al., 2008). This could imply that a reduced level of empathy could be due to problems with emotional awareness. Especially the discrimination between distress and empathy could be difficult for people with ASD or with alexithymia.

Davis (1980) writes, that “The empathic concern scale inquires about respondents feelings of warmth, compassion, and concern for others, while the personal distress scale measures the personal feelings of anxiety and discomfort that result from observing another's negative experience“ (p. 2).

Maner et al. (2002) showed that both feelings (empathy and distress as well as sadness) are present, when people are faced with a person in need. And both feelings can trigger helping behavior. A structural equation model that was done in the study of Maner et al. revealed that negative emotions and not empathy had a causal relationship to helping.

On the other hand, Batson, Early and Salvarani (1997a) found that imagine another person in need evokes more empathy than distress. However, pro-social behavior was not measured in this study. If people with ASD report less empathy, it does not mean, that there are no emotions at all towards people in need. It could also be, that instead of empathy they experience distress. It is also possible, that the experienced feeling is the same as for other people, but giving this feeling a name is more difficult for people with ASD (or alexithymia).

There is also one theory that says that there could be a stronger empathic reaction in people with ASD (Smith, 2009). This theory argues that some of the symptoms of autism could be due to an over arousal in social situations. Because of very strong sensations people with autism could detach themselves from feeling empathy.

1.9 Pro-social behavior in ASD

We know that pro-social behavior is associated with empathy (Batson et al., 1997b; Dickert et al., 2011; Maner et al., 2002; Basil et al., 2008; Verhaert & Van den Poel, 2011). We also know that people with ASD have lower scores on empathy scales (Lombardo, Barnes, Wheelwright & Baron-Cohen, 2007; Izuma, Matsumoto, Camerer & Adolphs, 2011). Does that mean that people with autism behave less pro-social? There is evidence that this is not the case.

Lin, Tsai, Rangel and Adolphs (2012) found that people with ASD did not donate significantly less than controls. This study focused mainly on the category of aid organization (e.g. people, animal and environment). There were minor differences in the preference for aid organizations between people with ASD and controls. They found that people with autism donate more for mental health organizations as controls (but not significant), although they donate significant less for “people organizations”. Altogether the differences between the two groups concerning the amount of donations and the motivation for donations were surprisingly low. Empathy was measured, but the focus of this study was on something else (preferences for type of aid organization).

Izuma et al. (2011) found in a donation task that people with ASD did not donate significantly less than controls. The focus of this study was on the so called “observer effect”. Due to this effect, people are more pro-social when they know that they are watched by other people. An analysis of this observer effect was done. The control group donated significantly more in the presence of an observer (compared with the condition in which they were alone). Autistic people did not show such an observer effect. Altogether (with and without observer) there was no significant difference in donations between people with ASD and controls. The interpretation of the authors is, that people with ASD lack the ability to take into consideration what other people think of them (lack of mentalization). People without ASD try to gain social reputation by helping others. Autistic people do not have such a need because it would require mentalization skills. Significant higher scores on an empathy scale in the control group did not lead to significant more donations in the control group.

In the two studies mentioned above there was no evidence, that people with ASD are less pro-social. No significant differences in overall donations were found. Just the preference for the type of aid organization and most likely the motivation for donations are different.

1.10 Lack of empathy in ASD in the context of forensic psychology

The potential lack of empathy in people with ASD and its consequences can be analysed also in the context of forensic psychology. In forensic psychology a lack of empathy is often used as explanation for violent acts (Soderstrom, 2003). In case that there is really a lack of empathy in people with ASD, there should also be a higher rate of violent acts related to autism.

According to Kristiansson and Sörman (2008) “most subjects with ASD are law abiding and will never commit any violent crime” (p. 55). Ghaziuddin, Tsai and Ghaziuddin (1991) reported a prevalence of aggression related to Asperger syndrome of 2,7 %. The authors don't see this rate as above the prevalence rate for violence in the general population.

On the other hand, Scragg and Shah (1994) found that 1,5 % of the patients of an forensic psychiatric secure hospital had Asperger syndrome. Together with equivocal cases the prevalence rate increased to 2,3 %. These rates are higher as the prevalence of the Asperger syndrome in the general population.

Even if there is a higher rate of crime in people with ASD, it does not mean that this is due to a lack of empathy. As in the two cases reported by Kristiansson and Sörman (2008) people with ASD are likely to commit violent crime because of strong obsessions or because of a lack in theory of mind.

In one of the two cases a man diagnosed with Asperger syndrome tried to kill a psychologist. Because of the mental problems of him and his wife, their child was taken care of by the social services. They contacted a child psychologist (the victim) to gain an external statement to their favor. As she could not help them, the man went to the psychologist's home and shot her in the head. First he did not feel guilty, but after his wife explained him that the woman probably also had a family,

he regretted his act. He just did not think about the consequences for the victim and her family. This example shows that not just a deficit in empathy could lead to violence. Also a lack in theory of mind can contribute to acts of violence.

1.11 Aim of the study: The empathy-altruism hypothesis in autism

The methods of the research for pro-social behavior and altruism will be used, to find out more about emotional responses in people with ASD. We will see whether empathy or distress can be induced by perspective-taking also in people with ASD. This is a puzzling question, because perspective-taking is a process that is difficult for people with ASD. A deficit in reading the mind of others is a core feature of the ASD. But that does not imply that perspective-taking cannot affect emotions of autistic people. We liked to find out more about the process of perspective-taking in ASD. Is it because of a lack of motivation that autistic people do not reflect about other people's life? And could perspective-taking be forced by an instruction or by guiding their attention to particular aspects of another person's life? With this work, we will find out more about perspective-taking capacities of people with ASD.

We also don't know, if there is a relationship between empathy and pro-social behavior in autistic people. The two studies with a focus of autism and donations (Lin et al., 2012 and Izuma et al., 2011) showed that people with ASD are not less willing to donate money to aid organizations. Although they also measured empathy with questionnaires, they did not mention if empathy and donations are related in people with ASD. The given work tried to fill the gap. It was the aim to find such a correlation between empathy and donations in people with ASD.

As well, we will see if this approach will confirm the findings, that people with ASD do not show less willingness to help others. The emotional aspects of this pro-social behavior could tell us more about the motivation for donations in people with ASD.

The intensity of the emotional arousal towards a person in need will be compared between people with ASD and a control group. Is there really less empathy in autistic people, will be one of the key questions. Alexithymia in ASD and the relationship to empathy will be examined as well.

1.12 Research question and hypotheses

One of the main questions was if the empathy-altruism hypothesis is also valid for autistic people. Since former works showed, that autistic people give as much money as others in donation tasks, it was expected that:

- H.1 there is a relationship between empathy and pro-social behavior in ASD

Four other results could be expected because of similar findings in former works:

- H.2 there is less self-reported empathy in ASD,
- H.3 there is more alexithymia in ASD,
- H.4 there is a negative correlation between alexithymia and empathy in ASD.
- H.5 there is no significant difference in donations between ASD and control group.

Since it is the first work, that tried to induce empathy via perspective-taking in an ASD group, there was no hypothesis for this part. For the control group similar patterns as found in former studies (Maner et al., 2002; Basil et al., 2008; Coke et al., 1978) are expected. But the procedure was done with a new stimulus. Therefore, also for the control group there was no hypothesis for the experimental part.

2. Methodes

2.1 Participants

Altogether 19 participants with ASD took part on the study. One person had to be excluded because of technical problems. The sound was off during watching the video. It was essential to hear the video and the procedure could not be repeated (otherwise the participant would have known already the questions to answer after). The remaining sample consisted of 18 participants with ASD (13 male; 5 female) and 20 control participants (15 male; 5 female). The participants were randomly assigned to one of the two conditions (perspective-taking vs. objective).

Because of missing values in the control group, two male participants more were recruited. All participants got 10 Euro as compensation for their participation.

Groups were matched on age (ASD: *M* = 35.2 years, *SD* = 11.7; Control: *M* = 33.4 years, *SD* = 11.2), intelligence as assessed with a short version of Raven's Standard Progressive Matrices (SPM; Raven, Raven & Court, 1999; ASD: *M* = 7.2, *SD* = 1.8; Control: *M* = 6.8, *SD* = 2.1) and language ability using the Mehrfachwahl-Wortschatz-Intelligenztest (MWT-B; Lehrl, 1995; ASD: *M* = 30.2, *SD* = 5,0; Control: *M* = 29.5, *SD* = 4.1). The values for the SPM and the MWT-B are based on total scores of correct answers.

A t-test for independent samples (two-tailed) confirmed that the groups were not significantly different in terms of age ($t(37) = .50$, $p = .62$), intelligence ($t(37) = .65$, $p = .52$) and language ability ($t(36) = .46$, $p = .65$).

Since all of this three variables were not normally distributed at least in one group a Mann-Whitney's U-test (two-tailed) was used as well. Again, no differences were found for age ($U(18,20) = 168$, $p = .726$), intelligence ($U(18,20) = 153$, $p = .411$) and language ability ($U(18,19) = 335$, $p = .418$).

All participants in the ASD group were high functioning and had received a diagnosis of autism or Asperger syndrome from a clinical psychologist or psychiatrist according to standard criteria. The Autism Diagnostic Observational Schedule (ADOS; Lord et al., 1989) was used in many cases, but not in all. Some participants got their diagnoses some years ago, where ADOS was not used as common standard. From the 19 participants, ADOS was used in 11 cases.

To evaluate the quality of the classification, all participants had to complete the short German version of the Autism Spectrum Quotient (AQ-K; Freitag et al., 2007). A t-test for independent samples (two-tailed) revealed that the difference in AQ-scores between the two groups (ASD and control) was highly significant ($t(25.5) = 6.70$, $p = .000$).

Control participants did not exhibit autistic features. The AQ-K was used to index the degree to which control participants reported autistic tendencies. Just one out

of the 20 control participants was above the threshold score of 17. With a score of 18 the deviation from the threshold score was marginal and therefore this person was not excluded.

All participants (ASD and control) gave their informed consent to participate in the study.

2.2 Procedure

All Participants had an individual appointment and run individually through the procedure. They knew already, that they had to watch a video and that they have to answer some questions about the video. First, participants read an introduction that described the study as an assessment of the relationship between emotions, pro-social behavior and personality traits (which it was). After participants read the introduction and signed an informed consent statement, the 10 Euro compensation was handed out in form of 2 euro coins (altogether 5 coins). After that, the experimenter started the video and left the room. This was essential because Izuma et al. (2011) showed that the presence of an observer could have different effects on the two groups (ASD vs. controls). The instruction at the beginning, the video and all questions related to the video were generated and presented via the software MATLAB.

2.3 Stimuli

Participants had to watch a video in which a homeless man was telling about his life. The video was 2 minutes and 23 seconds long. Since we did not know how people with ASD would react to a highly emotional stimulus we chose a less stressful storyline as Batson et al. (1997b) used with the story of Katie Banks.

In the video the man explains how homeless people are treated on the street. He tells about a situation in which he was really desperate and angry. In his opinion everybody could become homeless because of bad luck. He himself had to stop work because of health issues. Nevertheless, he had not lost hope.

The full video can be watched here (the producer of the video gave us the permission to use it):
https://www.youtube.com/watch?v=Xb3hM7ZcI6Y

2.4 Perspective-taking Manipulation

All participants were randomly assigned to a condition where they had to imagine how the person that was presented in the video was feeling (perspective-taking condition) or where they should not be focused on the feeling of the person (objective condition). The text for the two conditions was a German translation of the version used in Batson et al. (1997b) or Maner et al. (2002).

The perspective-taking instruction was:

> Während Sie das Video sehen, versuchen sie sich vorzustellen, welche Gefühle die Person im Video erlebt hat. Versuchen sie sich vorzustellen, wie die Ereignisse das Leben der Person verändert haben. Konzentrieren Sie sich nicht darauf, sich alle Informationen zu merken. Konzentrieren Sie sich einfach darauf, sich vorzustellen, wie sich die Person gefühlt hat.

The objective instruction was:

> Während Sie das Video sehen, versuchen Sie so objektiv wie möglich zu bleiben. Nehmen Sie eine neutrale Position im Bezug auf die Person und im Bezug auf was passiert ist ein. Um objektiv zu bleiben, versuchen sie sich nicht vorzustellen, was die Person erlebt hat und wie sie sich dabei gefühlt hat. Stellen Sie sich nicht vor, wie sich das Leben der Person verändert hat. Bleiben Sie objektiv und lassen Sie sich nicht von den Gefühlen der Person vereinnahmen.

Additional to the instructions, participants got the information that after watching the video, they will have to answer a question about it (control question). This information together with the question they will have to answer was displayed together with the instruction. With this instruction we wanted to ensure that all participants and especially the ones with ASD have high motivation to pay attention to the video.

The question was different in each condition. In the perspective-taking condition the question was about which emotion the man in the video was talking (the right answer was “anger”). In the objective condition it was asked for a statement that was given from the man in the video (“Who pays the postage for a letter?”). The difference in the two questions was used to foster the perspective the participants had to take (with focus on emotion or objective). The question was in a single-choice format. One option was correct and three other options were wrong. Whether or not the question was answered correctly was part of the analysis as well. A correct answer shows that the participant was motivated to watch the video with full attention.

2.5 Dependent measures

The dependent measures of the experimental part consisted of four variables. Distress and empathy were measured with a single-item because of concerns regarding the participants with ASD. Facing people with ASD with very similar questions, as they are used when scales of empathy or distress are applied, could cause confusion among participants with ASD. Single-items are frequently used in research on emotions (see Dickert, 2010), especially when states and not traits are measured.

A multivariate analysis of variance (MANOVA) was used to reveal the effects of the perspective-taking manipulation. Empathy, distress and money were analysed for the two factors “ASD vs. controls” and “perspective-taking vs. objective”. With this analysis it could be seen if perspective-taking increased empathy or distress. In case of more empathy (or distress), we could also prove if this leads to more donations. The MANOVA could also reveal differences between ASD group and control group for any of the three variables (empathy, distress and money). And interactions between these two factors could be illustrated as well.

2.5.1. Distress

A visual analog scale with a positive and a negative end-point was used to measure the distress experienced by watching the video. The range of the scale

was between -10 and + 10. The exact German question was “Wie belastend war das Ansehen des Videos für Sie?”.

For the statistical analysis the values were converted into positive values. A constant term of + 10 was added to each value. The analysis became easier with the new range from 0 to + 20.

2.5.2. Empathy

A visual analog scale with a positive and a negative end-point was used to measure the empathic response to the video. The range of the scale was between -10 and + 10. The exact German question was “Wieviel Mitgefühl haben Sie beim Ansehen des Videos empfunden?”.

For the statistical analysis the values were converted into positive values. A constant term of + 10 was added to each value. The analysis became easier with the new range from 0 to + 20.

2.5.3. Answer to the control question

If the control question was answered correctly or not was also a dependent measure and was part of the analysis. To exclude the participants, which could not answer this very simple question was a chance to see how the results are when motivation is high and the video was watched with full attention.

2.5.4. Money

Finally, participants had the chance to donate the money they got for participation in order to help the homeless man that was presented in the video. They had to rate how much of the 10 Euro they would like to donate. There was a penny bank located at the exit of the room in which they could put the coins in. The request was written and included the information, that the amount of donation stays anonymous and that it is also possible to give nothing. It was possible to give 0, 2, 4, 6, 8 or 10 Euro. Since all participants got the 10 Euro in 2 Euro coins, the situation was

exactly the same for every person. They got the information that the money will be given to the homeless man at the end of the study.

The request in German was as follows:

> „Danke für die Teilnahme! Wir möchten Ihnen nun die Gelegenheit geben einen Teil der Aufwandsentschädigung für Fipsi (der Mann im Video) zu spenden. Bitte geben Sie an wie viel Sie spenden möchten. Der Betrag bleibt selbstverständlich anonym. Sie können natürlich auch nichts spenden (drücken Sie hierfür 0). Am Ausgang befindet sich eine kleine Kassa. Werfen Sie hier den angegebenen Betrag ein. Der gesamte Betrag wird am Ende an Fipsi (der Mann im Video) übergeben. Drücken Sie TASTE 0 für 0 EURO, TASTE 1 für 2 EURO, TASTE 2 für 4 EURO, TASTE 3 für 6 EURO, TASTE 4 für 8 EURO oder TASTE 5 für 10 EURO"

2.6 Questionnaires and tests

Questionnaires and tests were used to gain additional results, to confirm former results and to reveal potential confounding variables. Confounding variables were used in a multivariate analysis of covariance (MANCOVA) to ensure, that they did not affect the results. For correlation analysis they were used for partial correlations. Some of the questionnaires and tests were necessary to match the ASD and the control group for important parameters. Beside from a questionnaire requesting demographic information, the following materials were used.

2.6.1. Toronto-Alexithymie-Skala-26 (TAS-26; Kupfer, Brosig & Brähler, 2000)

The German version of the Toronto Alexithymia Scale was used to assess the degree of self-reported alexithymic tendencies. The questionnaire consists of 26 items. All items were assessed on a five-point Likert scale with end-points of one to five. The TAS-26 has shown adequate internal consistency. The Cronbach's alpha for the total score is .81. Berthoz and Hill (2005) showed that for an English version the validity and the test-retest reliability were adequate. ASD participants did not have difficulties to complete the questionnaire. A description of the subscales is illustrated in table 1.

Table 1

Subscales of the Toronto-Alexithymie-Skala-26

Name of subscale	English name	Description of subscale	Reliability
Schwierigkeiten bei der Identifikation von Gefühlen	Difficulties identifying feelings	This scale describes the extent to which individuals have difficulties in identifying feelings. Also problems with distinguishing between feelings and bodily sensations due to emotional arousal are evaluated with this scale.	Cronbach's alpha .84
Schwierigkeiten bei der Beschreibung von Gefühlen	Difficulties describing feelings	The scale describes difficulties in showing feelings as well as talking about feelings. It covers the communicative aspects of emotions.	Cronbach's alpha .69
Extern orientierten Denkstil	Externally oriented thinking	Externally oriented thinking means a tendency to focus on external events more than on internal thoughts and feelings.	Cronbach's alpha .67

2.6.2 Autism Spectrum Quotient (AQ-K; Freitag et al., 2007)

The short German version of the autism-spectrum quotient was used to index the self-reported degree of autism. The questionnaire consists of three sub scales (social interaction and spontaneity, imagination and creativity, communication and reciprocity). Since the scale was used to obtain an approximation for the degree of autism, just the total score was part of the analysis. The test-retest reliability of .79 for the total score can be considered satisfying. A sensitivity of 89 % and a specificity of 92 % could be obtained with a cut-off value of 17.

2.6.3 Saarbrücker Persönlichkeitsfragebogen SPF (IRI/SPF; Paulus, 2009)

Individual differences in the self-reported personality traits fantasy, perspective-taking, empathic concern and personal distress were assessed with a German version of the Davis Interpersonal Reactivity Index (IRI/SPF; Paulus, 2009). In this German version, some items with low factor scores were excluded. Just positively formulated items remained. Paulus (2009) also found that items with negations correlated with intelligence. Especially for participants with ASD the questions should be clear and easy to understand. Therefore the IRI/SPF was chosen for this study. All items were assessed on a five-point Likert scale with end-points of one to five. The scales with reliability are illustrated in table 2.

Table 2

Scales of the Saarbrücker Persönlichkeitsfragebogen (SPF)

Name of scale	Description of subscale	Reliability
Emphatic concern scale (EC)	The tendency for an emotional experience of feelings like warmth, compassion and concern for an observed emotionality in others.	Cronbach's alpha .71
Perspective-taking scale (PT)	The tendency or ability to adopt the perspective, or point of view, of other people (in real life situations).	Cronbach's alpha .71
Fantasy scale (FS)	The tendency of the respondent to imaginatively transpose oneself into fictional situations (e.g. books, movies, daydreams)	Cronbach's alpha .74
Personal distress scale (PD)	The tendency to experience fear, apprehension and discomfort at witnessing the negative experiences of others.	Cronbach's alpha .66

2.6.4 Mehrfachwahl-Wortschatz-Intelligenztest (MWT-B; Lehrl, 1995)

With a language test it was controlled that there was no difference in language ability between the two groups (ASD vs. control). For this assessment a test named “Mehrfachwahl-Wortschatz-Intelligenztest” (MWT-B; Lehrl, 1995) was used. The test consists of 37 items and was created to measure crystallized intelligence

in a short period of time (approximately 5 minutes are enough). With this test it was possible to control also for differences in language ability without consuming much time of the participants. For each item there were five words. From these five words there was just one word a real one. The other ones were distractor words (words which do not exist). The participants had to mark the only right word for every item. The sum of right answers was used for the analysis. The correlation between the MWT-B and the parallel version of the test is high (r = .84) and the test-retest reliability of .87 after 14 months was good as well (Lehrl, 1991). Also validity was given, since high correlations (median of r = .72 in 22 samples) with other intelligence tests were found (Lehrl, Triebig & Fischer, 1995).

2.6.5 Raven's Standard Progressive Matrices

For the assessment of intelligence a short version of Raven's Standard Progressive Matrices (SPM; Raven et al., 1999) was used. The test consists of three training items to ensure that participants understood the instruction. All participants found the right solutions for the training items. After the training items, the real nine items had to be solved. Bilker et al. (2012) showed that a test with nine items leads to a substantial saving of time while preserving test characteristics of the full-length test.

3. Results

3.1 Missing values

There was just one missing value for all the questionnaires (a control person did not answer one question of the TAS-26). This missing value was replaced with the mean of the non-missing values of the scale that was affected. Also for the single item empathy there was one missing value (a control person did not move the cursor, which leads to a missing value for this scale). One value for the money could not be used (one control person did not donate the same amount of money as rated). The same person did not fill out the second page of the MWT. These values could not be replaced. Since all the missing values affected the control group, some more participants were recruited for the control group. This is also the reason why sometimes there were more subjects in the control group.

3.2 Testing the normality assumption

All dependent measures and the scores of the questionnaires were proved for normal distribution using the Shapiro-Wilk's normality test. The results are illustrated separately for ASD and controls in table 3. Many of the variables were not normally distributed in one of the two groups (age, empathy, money, SPM, fantasy scale of the IRI/SPF). Especially the variable money is very uneven distributed (see figure B-1 and B-2, appendix). In case of same sample size in all cells, the analysis of variance (ANOVA) is robust against violations of the normal distribution assumption (Bortz, 1989). In our analysis we had nearly same sample size in every cell. The ANOVA was used especially for the analysis of interactions. Additionally the groups were compared with a Mann-Whitney's U-test, when normal distribution was not given. For correlations, a Spearman's correlation was used, when normal distribution was not given.

Table 3

Test for normal distribution using the Shapiro-Wilk's normality test

	ASD group			control group		
	W	df	*p* value	*W*	df	*p* value
age	.915	18	.106	.849	18	.008**
distress	.929	18	.183	.921	18	.135
empathy	.884	18	.030*	.915	18	.107
money	.713	18	.000**	.836	18	.005**
SPM	.812	18	.002**	.861	18	.013*
MWT	.903	18	.065	.947	18	.386
IRI/SPF (EC)	.928	18	.178	.965	18	.694
IRI/SPF (FS)	.957	18	.539	.847	18	.008**
IRI/SPF (PT)	.901	18	.061	.968	18	.759
IRI/SPF (PD)	.942	18	.320	.958	18	.566
TAS-26 total	.943	18	.332	.962	18	.637
AQ total	.959	18	.591	.898	18	.053

Note: * $p < .05$. ** $p < .01$

3.3 Descriptive statistics

Means and standard deviations for age, dependent measures and the questionnaires are illustrated in table 4. In the same table the results from a t-test can be seen. The ASD group and the control group were compared with each other. Differences appeared for the personal distress scale of the IRI/SPF, the TAS-26 total-score and the AQ total-score.

For the TAS-26 a score of 54 is stated as cut-off value to classify people as alexithymic (Kupfer et al., 2000). No one of the control participants was above the cut-off score. In the ASD group there were exactly 50% of the participants above the cut-off score.

Table 4

Differences between ASD and control group (means, standard deviations and results of a t-test for independent samples/two-tailed)

	ASD group		control group				
	Mean	*SD*	Mean	*SD*	*t*	df	*p*
age	34.54	11.62	33.37	11.21	.315	36	.755
distress	7.69	5.63	9.63	6.04	-1.021	36	.314
empathy	10.47	5.11	12.84	5.89	-1.308	35	.200
money	3.11	4.07	2.11	2.05	.941	25	.356
SPM	7.33	1.75	6.80	2.14	.835	36	.409
MWT	30.17	5.17	29.47	4.07	.454	35	.653
IRI/SPF (EC)	13.72	2.27	13.90	3.02	-.203	36	.840
IRI/SPF (FS)	12.50	3.15	13.05	3.15	-.537	36	.594
IRI/SPF (PT)	14.11	3.18	14.05	3.03	.061	36	.952
IRI/SPF (PD)	12.89	3.23	9.95	2.98	2.915	36	.006**
TAS-26 total	50.28	10,82	40.00	6.32	3.526	27	.002**
AQ total	18.67	6.80	6.60	3.68	6.70	26	.000**

Note: * $p < .05$. ** $p < .01$

A Mann-Whitney's U-test was applied additionally for the variables that were not normally distributed in one of the two groups (age, empathy, money, SPM and the IRI/SPF scale fantasy). The results are illustrated in table 5. This non-parametric method did not reveal any different results.

Table 5

Differences between ASD and control group (Mann-Whitney's U-test for not normally distributed variables/two-tailed)

	N (ASD)	*N* (control)	*U*	*p* value
age	18	20	168	.726
empathy	18	19	115,5	.092
money	18	19	170	.975
SPM	18	20	152,5	.411
IRI/SPF (FS)	18	20	156,5	.487

Note: * $p < .05$. ** $p < .01$

3.4 Distribution of the variable money

In figure B-1 and B-2 the distribution of the variable money can be seen for both groups. Obviously the distribution in the ASD group is different compared to the control group. The Levene's test for equality of variances was highly significant ($F(1, 35) = 9.893$, $p = .003$). In the ASD group there were four participants they gave the entire 10 Euro. None of the participants in the control group gave all the money. At the same time, most of the ASD-participants gave nothing at all (8 ASD versus 7 controls). This leads to a U-shaped distribution in the ASD group (figure B-1, appendix).

3.5 Multivariate analysis of variance

The MANOVA revealed that there was no significant main effect. There was no effect for the condition ($F(3, 30) = 0.17$, $p = .917$ Wilk's $\Lambda = 0.983$) as well as for the group ($F(3, 30) = 0.13$, $p = .288$ Wilk's $\Lambda = 0.884$). But a significant effect was found for an interaction ($F(3, 30) = 3.09$, $p = .042$ Wilk's $\Lambda = 0.764$). In table 6 it can be seen, that just for the variable distress the interaction between group (ASD vs. controls) and condition (perspective-taking vs. objective) was significant.

Table 6

Tests of Between-Subjects Effects for empathy, distress and money with the factors group (ASD vs. controls) and condition (perspective-taking vs. objective)

		F	*p*
ASD vs. Controls	empathy	1.295	.264
	distress	.336	.566
	money	1.005	.324
Perspective-taking vs. Objective	empathy	.446	.509
	distress	.336	.566
	money	.000	1.000
Interaction	empathy	.208	.651
	distress	5.597	.024*
	money	.000	1.000

Note: * $p < .05$. ** $p < .01$

Figure 1 makes it easy to find an interpretation for this interaction. People with ASD experience more distress in the perspective-taking condition compared with the objective-condition.

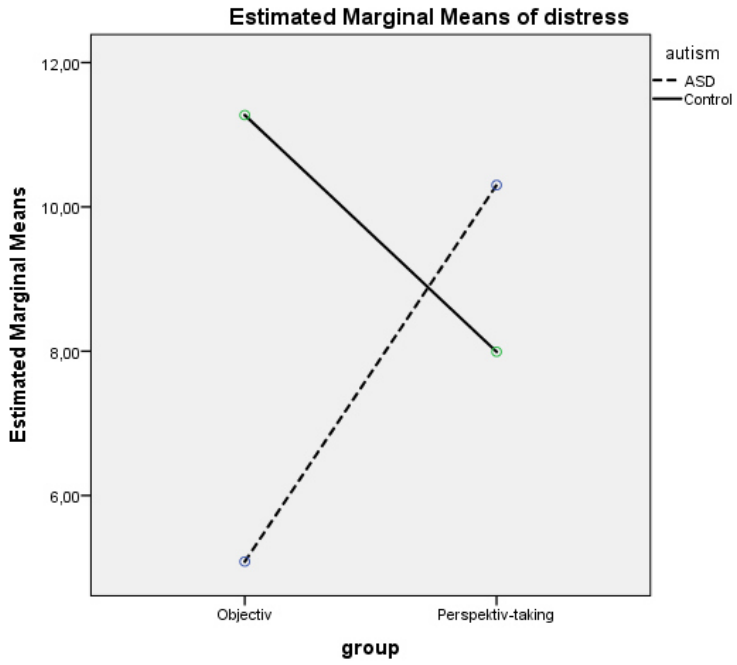

Figure 1. Interaction for the variable distress

Means and standard deviations for each cell are illustrated in table 7.

Table 7

Means and standard deviations for the two-way MANOVA

		ASD		controls	
		means	*SD*	Means	*SD*
empathy	perspective-taking	N =9 / 11.529	3.593	N=10 / 13.224	6.215
	objective	N= 9 / 9.404	6.324	N=9 / 12.418	5.845
distress	perspective-taking	N=9 / 10.302	5.300	N=10 / 7.992	6.530
	objective	N=9 / 5.084	4.883	N=10 / 11.272	5.321
money	perspective-taking	N=9/ 3.111	4.014	N=9 / 2.000	2.236
	objective	N=9/ 3.111	4.372	N=10 / 2.200	1.989

Normal distribution was given for distress, but not for empathy and money. That means that there were no doubts for the interaction of the variable distress. No significant results were found for empathy and money. But still it could be that this was the case because normal distribution was required for the statistical analysis that was used. With a Mann-Whitney's U-test (two-tailed) we ensured that there are really no significant differences between the two conditions in any of the two groups. For empathy there were no effects for perspective-taking in the ASD group ($U(9,9) = 33.5$, $p = .536$) as well as in the control group ($U(10,9) = 39$, $p = .624$). Also for money there was no significant effects in ASD group ($U(9,9) = 35.5$, $p = .638$) and in the control group ($U(9,10) = 41.5$, $p = .765$).

But confounding variables still could have influenced the results. Especially the small amount of participants could have led to an unequal distribution of some essential traits between the two conditions (perspective-taking vs. objective). Most of all, the personality trait distress could have influenced the finding. If there would be more personal distress (measured with the IRI/SPF) in the perspective-taking condition, than it would most likely also affect the experienced distress while watching the video. In table 8 it is shown, that this is not the case (a t-test for independent samples was used to compare the perspective-taking condition with the objective-condition). But in the same table it can be seen, that there is nearly a significant difference in the TAS-26-score. To ensure, that this finding does not influence the impact of perspective-taking on distress, an analysis of co-variance (ANCOVA) with the TAS-26 total-score as covariate (group and condition as fixed

factors) was used. The interaction between group and condition still was significant ($F(1, 32) = 4.892$, $p = .034$).

Table 8

T-test for independent samples to reveal significant differences between the two conditions (perspective-taking vs. objective)

	t	df	*p* (2-tailed)
age	-1.760	36	.087
SPM	.000	36	1.000
MWT	-.755	35	.455
IRI/SPF (EC)	.301	36	.765
IRI/SPF (FS)	-.619	36	.540
IRI/SPF (PT)	-1.227	36	.228
IRI/SPF (PD)	1.400	36	.170
TAS-26 total	1.959	36	.058
AQ total	1.640	36	.11

Note: * $p < .05$. ** $p < .01$

3.6 Correlations between dependent measures

Since two of the three dependent measures (empathy and money) are very uneven and not normally distributed, a non-parametric correlation (Spearman's correlation) was used. The results for ASD and control group are illustrated in table 9.

Table 9

Correlations between dependent measures for ASD and control group (Spearman's correlations, two-tailed significance test)

		empathy	distress	money
ASD group	empathy	-	$r = .605$, $p = .008$**	$r = .618$, $p = .006$**
	distress	$r = .605$, $p = .008$**	-	$r = .398$, $p = .102$
	money	$r = .618$, $p = .006$**	$r = .398$, $p = .102$	-
Control group	empathy	-	$r = .812$, $p = .000$**	$r = .317$, $p = .200$
	distress	$r = .812$, $p = .000$**	-	$r = .220$, $p = .365$
	money	$r = .317$, $p = .200$	$r = .220$, $p = .365$	-

Note: * $p < .05$. ** $p < .01$

Empathy and distress were significantly correlated in both groups. Somehow empathy and money were correlated just in the ASD group. In a second step, relationships between dependent measures and questionnaires were analysed to see if there are and confounding variables. Especially potential confounding variables that could influence the correlation between empathy and money in the ASD group were of interest. The results for the ASD group can be seen in table 10.

Table 10

Correlations between dependent measures and questionnaires for the ASD group (Spearman's correlations, two-tailed significance test)

		age	SPM	MWT	SPF (EC)	SPF (FS)	SPF (PT)	SPF (PD)	TAS-26	AQ total
distress	*r*	**-.67****	.30	**-.62****	.18	.24	-.08	.24	.24	-.03
	p	.00	.22	.01	.48	.33	.77	.33	.35	.90
	N	18	18	18	18	18	18	18	18	18
empathy	*r*	-.29	.33	-.27	**.61****	.26	.38	.44	-.04	-.17
	p	.24	.18	.28	.01	.30	.13	.07	.88	.50
	N	18	18	18	18	18	18	18	18	18
money	*r*	-.31	.18	-.43	.37	.07	.19	-.03	.03	-.21
	p	.22	.48	.08	.13	.77	.46	.92	.92	.40
	N	18	18	18	18	18	18	18	18	18

- $p < .05$. ** $p < .01$

In the ASD group there was just one variable that had a significant correlation with empathy or money. The sub scale empathic concern of the IRI/SPF correlated with the dependent measure empathy, as it could be expected. Since it is clear, that the personality trait empathy has a big impact on the empathic reaction in a particular situation, it is not necessary to analyse this dependency.

The results for the control group are illustrated in table 11.

Table 11

Correlations between dependent measures and questionnaires for the control group (Spearman's correlations, two-tailed significance test)

		age	SPM	MWT	SPF (EC)	SPF (FS)	SPF (PT)	SPF (PD)	TAS-26	AQ total
distress	*r*	.28	-.11	.04	.38	.25	.06	.35	-.15	-.03
	p	.23	.66	.86	.10	.29	.81	.13	.54	.90
	N	20	20	19	20	20	20	20	20	20
empathy	*r*	.01	.00	.13	**.61****	.07	.21	.36	-.06	.28
	p	.98	.99	.61	.01	.76	.39	.13	.80	.25
	N	19	19	18	19	19	19	19	19	19
money	*r*	-.35	.20	-.26	**.49***	.00	.20	.23	**.53***	.16
	p	.14	.41	.29	.03	.99	.42	.34	.02	.51
	N	19	19	19	19	19	19	19	19	19

- *p < .05. ** p < .01*

In the control group, the high and significant correlation between money and the TAS-26-score (r = .514) had to be considered as a confounding variable. It could be, that the correlation between empathy and money is lacking because of this confounding variable. The partial correlation (Spearman's) between empathy and money with the TAS-26 total-score as co-variable revealed indeed a higher correlation between empathy and money in the control group (*rs* (15) = .42, *p* > .05). But still, the correlation was not significant (*p* = .093, 2-tailed).

3.7 Impact of the control question

The control question could not be answered from some participants. Especially in the ASD group there were many wrong answers (5 wrong answers in ASD group vs. 3 wrong answers in control group). This could be due to a lack of attention or motivation while watching the video. Therefore the cases with wrong answers were excluded and the correlation analysis of the dependent variables was repeated without them. In Table 12 the correlations just for participants who gave the right answers are shown.

Table 12

Correlations between dependent measures for ASD and control group without participants with a wrong answer at the control question (Spearman's correlations, two-tailed significance test)

		empathy	distress	money
ASD	empathy	-	r = .791, p = .001**	r = .726, p = .005**
group	distress	r = .791, p = .001**	-	r = .536, p = .059
	money	r = .726, p = .005**	r = .536, p = .059	-
Control	empathy	-	r = .870, p = .000**	r = .480, p = .070
group	distress	r = .870, p = .000**	-	r = .414, p = .111
	money	r = .480, p = .070	r = .414, p = .111	-

Note: * $p < .05$. ** $p < .01$

The relationships between empathy, distress and money are getting stronger after excluding the participants with the wrong answers.

3.8. Additional results (correlations between questionnaires)

This chapter reports additional results and should be seen as exploratory research. The analysis was done without any hypothesis. It should help other researcher to find an interpretation in case of similar results. Also new hypotheses can be gained from these results.

3.8.1 Correlations for the ASD Group

Somehow, there was a significant correlation between age and AQ (see table A-1, appendix) as well as between the second sub-scale of the TAS-26 (talking about feelings) and age (see table A-3, appendix). The fantasy scale of the IRI/SPF correlated significantly with the AQ (see table A-1, appendix). The perspective-taking scale of the IRI/SPF had a significant correlation with the SPM score and the personal distress scale of the IRI/SPF correlated with the TAS-26-score (see table A-2, appendix).

3.8.2 Correlations for the control group

There was a significant correlation between one sub-scale of the TAS-26 (identifying feelings) with the perspective-taking scale of the IRI/SPF (see table A-2, appendix). The SPM had a significant negative correlation with the third sub scale (external style of thinking) of the TAS-26 (see table A-3, appendix).

4. Discussion

4.1 Effects of perspective-taking and group differences for the variables empathy, distress and money

The aim of this study was to gain insights into empathic feelings of autistic people toward a person in need. But also distress was of interest. We tried to induce these feelings with a well-established method. Participants had to put themselves into the shoes of someone else. In our case it was a homeless man that struggled with life. We examined if perspective-taking increased empathy and in turn pro-social behavior. Regarding just the literature of ASD-research one might thing that it is not possible for a person with ASD to execute perspective-taking because they are lacking theory of mind. Nevertheless we gave it a chance and applied a procedure that was used many times for the research of pro-social behavior or altruism. We did this, because of two studies that showed that people with ASD are as pro-social as others. There is also evidence, that empathy is not disturbed in people with ASD, when alexithymia is considered as well (Bird et al., 2010). But also the intensity of empathic feelings (and distress) and their relationship to pro-social behavior was of interest. We expected less self-reported empathy in the ASD group. The project also gave us the change to replicate other findings. The relationship of alexithymia and empathy was of interest (we expected a negative correlation).

It came out, that perspective-taking did not enhance empathy in both groups (ASD and control) and in turn it did not enhance the amount of donations. But the perspective-taking manipulation had effects on experienced distress in the ASD group. These results were surprising because perspective-taking worked in many

other studies at least in non-clinical groups (Maner et al., 2002; Basil et al., 2008; Coke et al., 1978).

The deviation might be explained by changes of the standard procedure that Batson et al. (1997b) or Maner et al. (2002) used. In these studies an audio tape was used. Participants had to listen to the story of Katie Banks, a college student who had lost the parents in a car accident and has to struggle to care for her siblings. In the given work, a less stressful story was chosen. There is no doubt that the video with the homeless man was touching for participants. This can be seen in the overall amount of donations. All participants together gave 96 Euro. On average they gave approximately 25 % of the given compensation. But maybe it needs a stronger stimuli for having effects from perspective-taking as well.

Also the way participants could help the person in need was different. To help Katie Banks it was possible to spend several hours stuffing and addressing envelopes for potential donors. This form of helping was not used because it could take more courage for people with ASD to do this kind of work. Stuffing and addressing envelopes in a place they don't know, with people they haven't met before could be much more stressful for people with ASD. Giving money was supposed to be equal for both groups. Two other things could have affected the results. The perspective-taking instruction was translated in German and a control question was included.

Still, there was more distress in the perspective-taking conditions in the ASD group. The question for distress was about how much distress they experienced while watching the video. It cannot be ruled out that the experienced distress was due to the perspective-taking instruction itself. The task (imagining how someone feels) could be more difficult and therefore more stressful for people with ASD. If so, the distress would not be experienced toward a person, the distress would be due to a stressful task that had to be performed. Since the correlation between empathy and distress is very high in both groups, this interpretation is unlikely. Empathy is other-oriented and has to be experienced toward a person. And the correlation suggests that also distress was experienced toward the man in the video.

We predicted that there is less self-reported empathy in the ASD group (H.2). We could not confirm this assumption. There was no significant difference between

ASD and control group in the empathic response to the video. We measured empathy as a trait also with the SPF, which is a German version of the IRI. This questionnaire consists of just 16 positively formulated items. It was used because of good psychometric properties. Of the four subscales (fantasy scale, perspective-taking scale, emphatic concern scale, personal distress scale), just the personal distress scale revealed group differences between ASD and controls. This is not in line with other studies (e.g., Lombardo et al., 2007). An explanation could be that the German version of the questionnaire is different from the one that was used in the former studies. Especially the lack of negatively formulated items could be an explanation. The original version of Davis (1980) contains also of negatively formulated items. Altogether the emotional response to the video was equal in ASD and control group.

Not only self-reported measures, but also behavioral consequences due to these emotions were analysed. The amount of donations was an important source of information, because self-reported responses require a certain amount of self-reflection. Differences in questionnaire scores between ASD and controls may not reflect true differences between the two groups. This differences could also be due to less or another way of self-reflection in people with ASD. Lombardo et al. (2007) showed that there is a lack of self-referential cognition in people with ASD. A lack of empathy was reported in the same study. But empathy was measured mainly with questionnaires. Bird et al. (2010) did not find differences between ASD and control group in the degree of empathy after accounting for alexithymia. In the study of Bird et al., the empathic response was measured with fMRI data. This source of data is highly objective and independent from interoception. For the given study it was not possible to use fMRI. But to study the behavioral consequences of empathy in people with ASD can support the findings of former works.

As hypothesized (H.5), the mean value of the money donated was not significantly different. The result is in line with the findings of Lin et al. (2012) and Izuma et al. (2011). In the two studies, there were also no significant differences in overall donations. This may imply that the intensity of the emotional experience is really equal in both groups.

But considering the uneven distribution of donations between the two groups may lead to another interpretation. Participants in the ASD group gave many times all the money they could give (4 participants). Most of the others gave nothing (8 participants). This tendency may be called an "all-or-nothing reaction". Maybe some people with ASD experience very strong feelings of empathy and that makes them giving all the money available. Because the correlation between empathy and money is very high, it is likely that they gave all the money because of empathic feelings.

4.2 The empathy-altruism hypothesis in ASD

The results support our assumption (H.1) that the empathy-altruism hypothesis is also valid for people with ASD. The strong relationship between empathy and the amount of donations suggests that people with ASD are also driven by empathy. There is a significant relationship between empathy and pro-social behavior also in autistic people. After excluding the participants, they could not answer the control question, the correlation got stronger in both groups. The amount of participants that could not answer the control question was higher in the ASD group (5 vs. 3 participants with wrong answers). A wrong answer in the control question could be due to problems with attention, as they are reported for people with ASD (Geurts, Verté, Oosterlaan, Roeyers & Sergeant, 2004). Strong sensations while watching the video could distract some participants from watching the video carefully. Since the sample size was small and there was just one video to watch, this conclusions are rather speculative. Further studies with emotional videos (with different intensity) and control questions could examine this assumption.

That there was no significant correlation between empathy and donations in the control group is most likely due to the small sample size, since this relationship could be proven in many other studies (Maner et al., 2002; Lee & Chang, 2007; Basil et al., 2008). There was also a correlation between money and the empathy scale of the IRI/SPF in the control group.

4.3 References to former studies and unexpected correlations

Some results are in line with former studies and others are not. As already discussed, there was not less empathy in the ASD group (not in the dependent measure and not in the trait empathy). This finding contrasts with former works (e.g., Lombardo et al., 2007). Further works could reveal if this was the case because of the different questionnaire that was used.

As expected, the ASD group scored significantly higher on the TAS-26. Even 50 % of the ASD-participants were above the cut-off value and can be classified as alexithymic. This is in line with hypothesis H.3 and the findings of Silani et al. (2008) or Hill et al. (2004). A negative correlation between TAS-26 and the empathy scale of the IRI/SPF as in Silani et al. (2008) or Bird et al. (2010) could not be found (other than predicted in hypothesis H.4). Such a relationship was also not found for TAS-26 and the dependent measure empathy.

The positive correlation between TAS-26-score and money in the control group lacks of an interpretation. There was no hypothesis for this kind of correlation and it is not known if such a correlation was already found in former works. There is no reason why difficulties in experiencing emotions should lead to more donations.

Negative correlations between AQ and the perspective-taking scale of the IRI/SPF make sense and somehow there was a positive correlation between AQ and age in the ASD group. The positive correlation between SPM and the perspective-taking scale of the IRI/SPF in the ASD group could imply that intelligence could help people with ASD to understand other people's mind.

Since the focus of this work was on other questions and there were no hypothesis for these correlations, the interpretation is rather speculative. Also the problem of an alpha error accumulation has to be considered.

5. Conclusion

In the present study the relationship between empathy and pro-social behavior in people with ASD was investigated. We tried also to induce empathy and pro-social

behavior with perspective-taking. Although this works reveals not too much information about the perspective-taking process in people with ASD. But insights about the empathic experience of people with ASD could be gained. People with ASD are not less willing to help. This finding itself can be interpreted in a way that people with ASD are as empathic as other people. Additionally, no differences were found in self-reported empathy when faced with a person in need. Also the empathic concern scale did not show differences between ASD and control group. Altogether, the empathic reaction of people with ASD seems to be very similar to the one of a non-clinical population.

Self-reported empathy caused a behavioral tendency to help, also in people with ASD. Especially the distribution of the donated money is worth to study in detail. Why are some people with ASD willing to give all the money, while no one in the control group was that generous? Conclusions could be found through a new study with a trial of different stories, with different emotional content. After every story they would have to rate their emotions and the amount of money they would give. In such a study income should be considered as a confounding variable. Since people with ASD are frequently faced with unemployment (see Robertson, 2009) their willingness to help could be underestimated in this study.

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https://www.youtube.com/watch?v=Xb3hM7ZcI6Y [22.10.2015]

Appendix A

(Tables)

Table A-1

Correlations between AQ and other questionnaires and variables (Pearson's correlations, two-tailed significance test)

		Correlation with AQ total in ASD group	Correlation AQ total in control group
TAS-26 fullscore	Correlation (*r*)	.31	.11
	p	.21	.63
	N	18	20
IRI/SPF (EC)	Correlation (*r*)	-.15	.09
	p	.56	.70
	N	18	20
IRI/SPF (FS)	Correlation (*r*)	**-.61****	-.23
	p	**.01**	.32
	N	**18**	20
IRI/SPF (PT)	Correlation (*r*)	-.46	-.44
	p	.06	.05
	N	18	20
IRI/SPF (PD)	Correlation (*r*)	.26	.35
	p	.31	.13
	N	18	20
SPM	Correlation (*r*)	.05	-.41
	p	.86	.07
	N	18	20
MWT	Correlation (*r*)	.31	.08
	p	.21	.75
	N	18	19
age	Correlation (*r*)	**.56***	-.05
	p	**.02**	.85
	N	**18**	20

*p < .05. ** p < .01*

Table A-2

Correlations between IRI (SPF) and other questionnaires and variables (Pearson's correlations, two-tailed significance test)

		ASD group				Control group			
		IRI/ SPF (EC)	IRI/ SPF (FS)	IRI/ SPF (PT)	IRI/ SPF (PD)	IRI/ SPF (EC)	IRI/ SPF (FS)	IRI/ SPF (PT)	IRI/ SPF (PD)
TAS-26 total	*r*	.07	-.32	-.02	**.53***	.20	.07	.11	.13
	p	.79	.19	.94	**.02**	.41	.77	.63	.58
	N	18	18	18	**18**	20	20	20	20
TAS-26 scale1	*r*	.04	-.28	.26	.39	.37	.38	**.50***	.04
	p	.87	.26	.30	.11	.11	.10	**.03**	.87
	N	18	18	18	18	20	20	**20**	20
TAS-26 scale2	*r*	.07	-.47	-.34	.45	-.06	-.15	.09	-.24
	p	.78	.05	.17	.06	.82	.53	.71	.32
	N	18	18	18	18	20	20	20	20
TAS-26 scale3	*r*	.04	.17	-.14	.36	.00	-.12	-.42	.44
	p	.87	.51	.59	.15	.99	.63	.06	.05
	N	18	18	18	18	20	20	20	20
SPM	*r*	-.11	.10	**.51***	05	.25	.11	.30	-.17
	p	.67	.70	**.03**	.85	.29	.64	.20	.48
	N	18	18	**18**	18	20	20	20	20
MWT	*r*	.07	-.24	.05	.12	.06	.28	-.25	.38
	p	.79	.34	.85	.64	.81	.24	.30	.11
	N	18	18	18	18	19	19	19	19
age	*r*	-.12	-.46	-.06	.20	-.04	.21	-.32	.26
	p	.65	.06	.80	.44	.88	.37	.18	.27
	N	18	18	18	18	20	20	20	20

** p < .05. ** p < .01*

Table A-3

Correlations between TAS-26 and other variables (SPM, MWT and age) - (Pearson's correlations, two-tailed significance test)

		ASD group				Control group			
		TAS-26 total	TAS-26 scale1	TAS-26 scale2	TAS-26 scale3	TAS-26 total	TAS-26 scale1	TAS-26 scale2	TAS-26 scale3
SPM	*r*	.08	.21	-.15	.03	-.10	.25	.03	**-.45***
	p	.76	.40	.54	.90	.68	.30	.91	**.05**
	N	18	18	18	18	20	20	20	**20**
MWT	*r*	-.19	-.36	-.05	.18	-.33	-.26	-.40	.16
	p	.45	.15	.86	.47	.18	.28	.09	.51
	N	18	18	18	18	19	19	19	19
age	*r*	.30	.10	**.51***	.08	-.39*	-.42	-.43	.25
	p	.22	.68	**.03**	.75	.09	.07	.06	.29
	N	18	18	**18**	18	20	20	20	20

- $p < .05$. ** $p < .01$

Appendix B

(Figures)

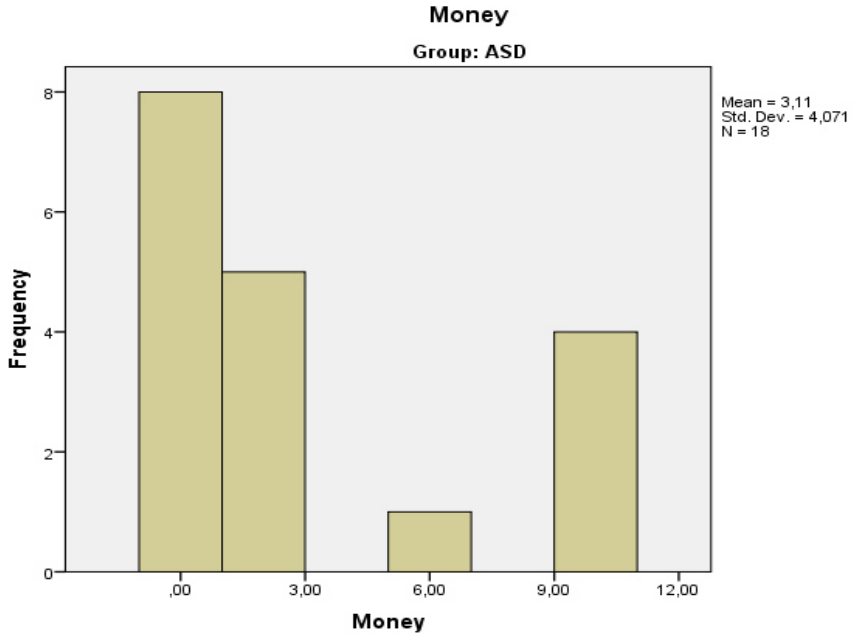

Figure B-1. Histogram for amount of donations done by the ASD-participants

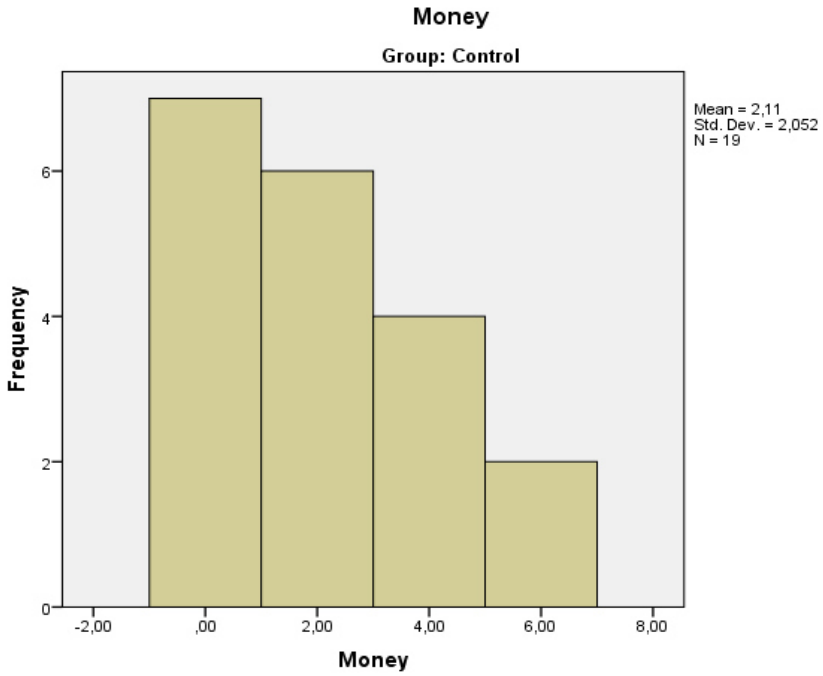

Figure B-2. Histogram for amount of donations done by the control-participants

Appendix C
(Abstract)

The present study applied a paradigm from the research field of pro-social behavior to a group of autistic people and a control group. It was examined how perspective-taking changed the emotional experience of the participants towards a person in need. They had to watch a video in which a homeless man talked about his life. Participants had to take the perspective of this person in need. It was examined if pro-social behavior could be induced with this procedure (participants could donate money for the man at the end of the study). Group differences for the two conditions (perspective-taking and objective) as well as for the two groups (autism and control) were analysed for the variables empathy, distress and pro-social behavior.

Perspective-taking did not lead to more empathy in any of the two groups. In the autism group, more distress was reported. There was a relationship between empathy and pro-social behavior in the autism group. No differences were found for the emotional experiences, when autism and control group were compared with each other. Also pro-social behavior was not different. It could be shown, that people with autism are not less empathic or helpful than people without autism. The results contrast with other studies, which have found less empathy in autistic people. This could be due to a different method that was used to measure empathy.

Appendix D
(Zusammenfassung)

In der vorliegenden Studie wurde ein Paradigma aus dem Forschungsfeld „prosoziales Verhalten“ an einer Autismus- und einer Kontrollgruppe angewendet. Es wurde untersucht, wie sich das emotionale Erleben der Teilnehmenden verändert, wenn diese aufgefordert werden, die Perspektive einer notleidenden Person einzunehmen, während sie ein Video sahen, indem ein Obdachloser (die notleidende Person) über sein Leben erzählte. Es wurde auch untersucht, ob hierdurch prosoziales Verhalten induziert werden konnte, indem den Teilnehmenden die Möglichkeit gegeben wurde, für den Obdachlosen zu spenden. Unterschiede zwischen den beiden Gruppen (Autismus- und Kontrollgruppe) und zwischen beiden Bedingungen (Persektivenübernahme und Objektiv) wurden für die Variablen Empathie, Distress und prosoziales Verhalten untersucht.

Die Perspektivenübernahme hat in keiner der beiden Gruppen zu mehr Empathie geführt. In der Autismusgruppe wurde jedoch mehr Distress berichtet. Ein Zusammenhang zwischen Empathie und prosozialem Verhalten hat sich in der Autismusgruppe gezeigt. Es gab keinen Unterschied im emotionalen Erleben, wenn Autismus- und Kontrollgruppe miteinander verglichen wurden. Ebenso hat sich das Ausmaß der Hilfsbereitschaft nicht unterschieden. Es konnte gezeigt werden, dass Personen mit Autismus nicht weniger empathisch oder hilfsbereit sind, als Personen ohne Autismus. Dass dieses Ergebnis von früheren Studien abweicht, könnte damit zusammenhängen, dass Empathie auf eine andere Art erhoben wurde.

Appendix E
(Curriculum Vitae)

Persönliche Daten:

Name: Martin Almhofer

Geburtsdatum: 16.11.1982

Nationalität: Österreich

Wissenschaftlicher Werdegang:

2010 – 2013 Bachelorstudium Psychologie an der Universität Wien

ab 2013 Masterstudium Psychologie an der Universität Wien

Beruflicher Werdegang:

2013 – 2014 Österreichische Autistenhilfe (6-Wochen Praktikum)

2011 – 2004 Austrian Standards Institute (Schriftführer)

2006 – 2010 GrECo International AG (Account Executive)

2005 – 2006 Sprachreisen

2004 – 2005 Volkshilfe Oberösterreich (Zivildienst)

2002 – 2004 Versfinanz GmbH (Fachbetreuer)

1999 – 2002 Allianz Versicherung AG (Lehre Versicherungskaufmann)

Sprachkenntnisse:

Deutsch:	Muttersprache
Englisch:	fließend
Französisch:	Grundkentnisse

Zusätzliche Qualifikationen:

Zertifiziert als Testleiter für das Verfahren AID (Adaptives Intelligenz Diagnostikum)