

**Fachbereich Erziehungswissenschaft und Psychologie
der Freien Universität Berlin**

TOWARDS A RESOURCE-ORIENTED APPROACH IN
AUTISM RESEARCH: STRENGTHS RELATED TO
PERSONALITY AND SPECIAL INTERESTS IN HIGH-
FUNCTIONING INDIVIDUALS ON THE AUTISM-SPECTRUM

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“If I could snap my fingers and be nonautistic, I would not. Autism is part of what I am”

Temple Grandin (2006), American professor of animal science, best-selling author

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LIST OF ORIGINAL PUBLICATIONS

This dissertation is based on the following original research articles

Study 1 (Pre-Print Version):

Kirchner, J.C., Ruch, W., Dziobek, I. *Character strengths in high-functioning individuals with autism spectrum conditions*

Publishers Version can be found here:

Kirchner, J.C., Ruch, W., Dziobek, I. *Brief Report: Character Strengths in Adults with Autism Spectrum Disorder Without Intellectual Impairment*

Journal of Autism and Developmental Disorders, October 2016, Volume 46, Issue 10, pp 3330–3337, doi: 10.1007/s10803-016-2865-7

DOI-Link: <http://dx.doi.org/10.1007/s10803-016-2865-7>

Study 2:

Kirchner, J. C., Schmitz, F., & Dziobek, I. (2012). *Brief report: stereotypes in autism revisited*. Journal of Autism and Developmental Disorders, 42(10) 2246-51,

doi: 10.1007/s10803-012-1460-9

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Study 3:

Kirchner, J. C., & Dziobek, I. (2014). *Toward the Successful Employment of Adults with Autism: A First Analysis of Special Interests and Factors Deemed Important for Vocational Performance*. Scandinavian Journal of Child and Adolescent Psychiatry and Psychology, 2(2), 77–85

Study 4:

Vogele, K., **Kirchner, J. C.**, Gawronski, A., Tebartz van Elst, L., & Dziobek, I. (2013). *Toward the development of a supported employment program for individuals with high-functioning autism in Germany*. European Archives of Psychiatry and Clinical Neuroscience, 263 Supplement, S197–203, doi: 10.1007/s00406-013-0455-7

DOI: Link: <http://dx.doi.org/10.1007/s00406-013-0455-7>

SUMMARY

While traditional research has focused on clinical aspects and deficits associated with autism, there have been recently claims towards a more strength-based approach to identify resources and pave the road for the better inclusion of autistic individuals in society (Mottron, 2011). These claims are in line with the aim of positive psychology to extend the scope of clinical psychology beyond suffering and focusing on optimal functioning and well-being (Duckworth, Steen, & Seligman, 2005 *p.629*). In the last decade, there has been an upsurge in research regarding strengths related to a specific cognitive style or special isolated skills in autistic individuals (Mottron, Dawson, Soulières, Hubert, & Burack, 2006), whereas works on strengths related to personality and special interests have received less attention. Gaining a better understanding of strengths in autistic individuals is especially relevant in the context of poor outcomes in adulthood, e.g. high unemployment rates. Especially high-functioning autistic individuals seem to stay behind their potential regarding employment, failing to find employment adequate to their education (Riedel, 2015). This dissertation aims to contribute to a better understanding of strengths of high-functioning autistic individuals in general, as well as ascertaining the factors that facilitate employment in this population more specifically. Therefore, the aims of this dissertation were twofold:

The aim of part 1 was to advance knowledge regarding strengths related to personality in high-functioning autistic adults. More specifically, in study 1 we assessed character strengths with the Values in Action Inventory (VIA-IS, Park, Peterson, & Seligman, 2004) and found the signature strengths profile (top-ranked character strengths) of the autistic group to comprise mainly intellectual strengths. Correlation analysis between character strengths and satisfaction with life revealed the strongest associations between emotional and interpersonal strengths with satisfaction with life in the autistic group. In study 2, we followed up on the assumption that autistic individuals are less prone to stereotypes due to reduced social learning. Using an Implicit Association Test, we indeed found evidence for reduced levels of social bias in autistic individuals.

The main goal of part 2 of this dissertation was to identify work-related strengths and factors relevant for optimal functioning at work. In study 3, we assessed special interests with a focus on vocational use and factors deemed important for vocational performance by means of a survey in autistic adults. While the results showed that special interests lie as often in social sciences and creative fields as in natural sciences and technology/engineering,

the work style approach taken within these fields was most commonly characterized by systemizing rather than a creative or knowledge-acquiring pursuit. Social interaction problems with co-workers and superiors as well as sensory issues were most often rated as interfering with work performance, while the awareness of employers and colleagues about the individual's autism diagnosis was among the most common factors reported to facilitate work performance. Based upon the results of study 3 and a review of the literature, we outlined a supported employment program (SEP), which targets inclusion in the work market for high-functioning autistic individuals (study 4).

In the first chapter of this dissertation, current literature that underlies and illustrates the pertinence of the four studies presented within the scope of this dissertation is reviewed. First, the historical development of autism diagnosis is briefly outlined, followed by brief outlooks concerning its prevalence, etiology and comorbidities. This is followed by a summary of various neuropsychological frameworks that have been proposed to explain different aspects of autistic symptomatology and characteristics. In the next section, I introduce studies 1-3 of this dissertation focusing on strengths related to the personality and special interests of high-functioning autistic individuals. I subsequently introduce the concept of inclusion and review research results regarding social outcomes in autistic adults, with a focus on employment. This section concludes with a brief outline of study 4. Based upon the summarized literature, the aims and research questions of this dissertation are developed. Subsequently, the original studies (chapter 2-3) are provided. The discussion chapter features individual discussions of each of the four studies, focusing on arguments that were not discussed in that extent in the original article, before concluding with a critical assessment of the current state of employment research in autistic individuals and a discussion of the opportunities and limitations of the strength-focused research approach in autism. Taken together, the results of this dissertation show that the assessment of special interests and strengths related to personality is an important step towards the more successful inclusion of high-functioning autistic adults.

ZUSAMMENFASSUNG

Forschung fokussiert traditionell besonders klinische Aspekte und Defizite, die mit Autismus assoziiert sind. Jedoch gibt es neuerdings verstärkt Forderungen, Stärken von Autisten in den Mittelpunkt von Forschungsbemühungen zu rücken, um eine bessere gesellschaftliche Integration von Autisten zu ermöglichen (Mottron, 2011). Diese Forderungen sind im Einklang mit dem Ziel der Positiven Psychologie, die Reichweite der klinischen Psychologie zu vergrößern und Faktoren zu erforschen, die zu einem erfüllenden Leben und Zufriedenheit beitragen (Duckworth et al., 2005) In der letzten Dekade wurden bereits vermehrt Stärken bei Autisten untersucht, die durch einen spezifischen kognitiven Stil oder spezielle isolierten Fähigkeiten charakterisiert sind (Mottron et al., 2006).

Jedoch ist über andere Stärken, wie solche, die mit Persönlichkeitsfaktoren zusammenhängen, als auch über die bei hochfunktionalen Autisten häufig vorhandenen Spezialinteressen, noch immer wenig bekannt. Ein besseres Verständnis über Stärken kann auch bezüglich der Verbesserung von häufig problematischen Lebensumständen von Autisten im Erwachsenenalter relevant sein. Eine weit verbreitete Problematik bei Erwachsenen im Autismus-Spektrum ist Arbeitslosigkeit und Unterbeschäftigung. Insbesondere hochfunktionale Autisten haben häufig Schwierigkeiten, eine ihrer Ausbildung angemessene Beschäftigung zu finden. Diese Dissertation soll einen Beitrag leisten, das Verständnis von Stärken von hochfunktionalen Autisten zu verbessern und insbesondere Faktoren, die für erfolgreiche Erwerbstätigkeit relevant sind, zu identifizieren.

Diese Dissertation verfolgt daher zwei Ziele:

In Teil 1 werden die Persönlichkeit betreffende Stärken untersucht. In Studie 1 haben wir Charakterstärken mit dem Values in Action Inventory (VIA-IS, Park et al., 2004) gemessen. Die Ergebnisse dieser Studie zeigen für die autistische Versuchsgruppe, dass das Signaturstärkenprofil (top-gerankte Charakterstärken) besonders durch intellektuelle Charakterstärken charakterisiert ist und emotionale und interpersonelle Charakterstärken mit Lebenszufriedenheit assoziiert sind. In Studie 2 fanden wir unter Anwendung eines Impliziten Assoziationstest Belege für die Hypothese, dass Autisten ein geringeres Ausmaß an stereotypen Einstellungen haben.

Das Hauptziel von Teil 2 dieser Dissertation war die Identifizierung von Stärken von hochfunktionalen Autisten, die für erfolgreiche Beschäftigung und Arbeitsintegration relevant sind. In Studie 3 wurden mittels Fragebogen beschäftigungsrelevante

Spezialinteressen erfasst und darüber hinaus Faktoren erhoben, die von dieser Personengruppe als hinderlich oder förderlich für eine erfolgreiche Tätigkeit am Arbeitsplatz beurteilt werden. Während Spezialinteressen zu fast gleichen Teilen im Bereich der Sozialwissenschaften, im kreativen Bereich oder in den Naturwissenschaften und im Technischen Bereich lagen, war der Zugang zu den Spezialinteressen meist durch eine systematisierende Herangehensweise gekennzeichnet (im Gegensatz zur kreativen oder wissenserwerbenden Herangehensweise). Probleme in der sozialen Interaktion mit Kollegen und Vorgesetzten, als auch sensorische Überempfindlichkeiten, wurden häufig als hinderlich am Arbeitsplatz genannt, während das Wissen von Kollegen und Vorgesetzten über die Autismusdiagnose meist als förderlich im Hinblick auf die eigene Arbeitsleistung genannt wurde. Unter Hinzunahme der Ergebnisse von Studie 3 und einer umfangreichen Durchsicht der Literatur entwickelten meine Co-Autoren und ich in Studie 4 einen Entwurf für ein Programm zur beruflichen Integration für hochfunktionale Autisten.

Im ersten Kapitel dieser Dissertation wird relevante Literatur dargestellt, welche die Bedeutung der Studien unterstreicht, die im Rahmen dieser Dissertation präsentiert werden. Zunächst wird ein kurzer Abriss der historischen Entwicklung der Autismusdiagnose gegeben und danach wird kurz auf Prävalenz, Ätiologie und Komorbiditäten eingegangen. Im Folgenden werden die wichtigen neuropsychologischen Theorien zusammengefasst, welche verschiedene Aspekte der autistischen Symptomatologie und Charakteristiken zu erklären versuchen. In der darauffolgenden Sektion leite ich die empirischen Studien 1-3 dieser Dissertation ein, welche auf persönlichkeitsassoziierte Stärken und Spezialinteressen fokussieren. Dem Konzept von Inklusion folgt ein Überblick über empirische Arbeiten bezüglich der Lebensumstände von Autisten im Erwachsenenalter mit einem besonderen Fokus auf die berufliche Situation. Diese Sektion wird durch eine kurze Einleitung in Studie 4 abgeschlossen. Basierend auf der zusammengefassten Literatur werden die Ziele und Forschungsfragen dieser Dissertation abgeleitet. Anschließend werden die Studien 1-4 vorgestellt (Kapitel 2-3).

Das Diskussionskapitel (Kapitel 4) beinhaltet zunächst individuelle Diskussionen der einzelnen Studien, die auf Aspekte fokussieren, die in diesem Ausmaß noch nicht in den jeweiligen Originalarbeiten diskutiert wurden. Abschließend wird der Status Quo der Erforschung der beruflichen Situation von Autisten kritisch evaluiert und die Chancen und Grenzen des auf Stärken fokussierenden Ansatzes in der Autismusforschung diskutiert. Zusammengefasst zeigen die Ergebnisse der vorliegenden Dissertation, dass das bessere Verständnis von Spezialinteressen und Stärken ein wichtiger Schritt hin zur erfolgreichen Inklusion von hochfunktionalen Autisten ist.

1 THEORETICAL BACKGROUND

1.1 AUTISM

1.1.1 HISTORY

Autism was first described in the 1940s by child psychiatrist Leo Kanner in the United States and pediatrician Hans Asperger in Austria. Kanner described a group of children with a pattern of abnormal behaviors including social aloofness and indifference - especially to other children – and a preoccupation with objects and repetitive routines, which he called “early infantile autism” (Kanner, 1943). Just one year later, Hans Asperger published his account on a group of boys with similar behaviors, which he described with the term “autistic psychopathy” (Asperger, 1944). As common characteristics of these children, he described (among others) disturbances in social contact including abnormal eye contact and a paucity of facial expression. However, in addition to describing problematic symptomatology, he also referred to a special autistic intelligence that becomes apparent through a special creative attitude towards language and special interests, which enable affected individuals to achieve extraordinary levels of performance in circumscribed areas.

Interestingly, both publications had striking similarities, despite the authors being unaware of each other’s work. Whereas Kanner’s work soon became widely known internationally, Asperger’s work - which was first published in German - was only brought to wider attention when Lorna Wing published her -by now historic- paper on the Asperger Syndrome (Wing, 1981) and Uta Frith translated Asperger’s work into English (Asperger, 1991). Lorna Wing discussed the similarities of Kanner’s and Asperger’s descriptions (Wing, 1991) and introduced the concept of the autism spectrum, in which Kanner Autism and Asperger Syndrome are considered to lay on a continuum of varying degrees of impairments in social interaction, communication, imagination and narrow, repetitive behavior (Wing, 1988, 1996).

Autism was first formally introduced as a diagnosis in the third edition of the Diagnostic and Statistical Manual of Mental Disorders (American Psychiatric Association, 1980) as a pervasive developmental disorder. In the DSM-IV, autism diagnostic criteria included early onset of a triad of features: impairments in social interaction, impairments in communication and restricted, repetitive, and stereotyped behavior, interests and activities (American Psychiatric Association, 1994). Furthermore, in the DSM-IV, Asperger’s disorder was introduced as a categorical disorder. In May 2013, the latest revision of the manual – the DSM 5 - was published (American Psychiatric Association, 2013), in which

the umbrella term autism spectrum disorder (ASD) was applied to a dyad of symptomatology: difficulties in social communication and social interaction, and restricted and repetitive behavior, interests, or activities with early onset. The DSM 5 no longer differentiates between sub-types, although it allows for the assessment of the individuals need for support and other specifications (e.g. intellectual level, speech development).

1.1.2 DIAGNOSIS

1.1.2.1 DIAGNOSTIC CRITERIA

The diagnostic criteria applied in the empirical studies of this thesis are those of the DSM-IV-R (American Psychiatric Association, 2000) for *Autistic disorder* or *Asperger Syndrome*, as these were the current diagnostic criteria at the time when the studies were conducted. Only autistic individuals without intellectual impairments - i.e. *high-functioning individuals* - were included in our studies.

For the application of the diagnosis *Autistic disorder*, symptomatology has to be present in three domains: (1) qualitative impairment in social interaction; (2) qualitative impairments in communication; and (3) restricted repetitive and stereotyped patterns of behavior, interests and activities.

(1) *Qualitative impairments in social interaction* are defined by the presence of at least two of the following symptoms: a) marked impairments in the use of multiple nonverbal behaviors; b) the failure to develop peer relationships appropriate to developmental level; c) a lack of spontaneous seeking to share enjoyment, interests or achievements with other people; or d) a lack of social or emotional reciprocity.

(2) *Qualitative impairments in communication* are manifested by at least one of the following symptoms: a) a delay in - or total lack of - the development of spoken language; b) marked impairment in the ability to initiate or sustain a conversation with others (in individuals with adequate speech); c) stereotyped and repetitive use of language or idiosyncratic language; or d) lack of varied, spontaneous make-believe play or social imitative play appropriate to the developmental level.

(3) *Restricted repetitive and stereotyped patterns of behavior, interests and activities*, as manifested by at least two of the following symptoms: a) encompassing preoccupation with one or more stereotyped and restricted patterns of interest that are abnormal in either

intensity or focus; b) apparently inflexible adherence to specific, non-functional routines or rituals; c) stereotyped and repetitive motor mannerisms; or d) persistent preoccupation with parts of objects.

Furthermore, there must be a delay or abnormal functioning with onset prior to the age of three years in at least one of the following areas: (A) social interaction; (B) language as used in social communication; or (C) symbolic or imaginative play. In addition, the disturbance must not be better accounted for by Rett's Disorder or Childhood Disintegrative Disorder.

For the diagnosis of *Asperger Syndrome*, symptomatology for *qualitative impairment in social interaction and restricted repetitive and stereotyped patterns of behavior, interests and activities* have to be present as described above. In contrast to Autistic disorder, no clinically significant general delay in language (e.g. single words used by the age of two years, communicative phrases used by the age of three years) has to be present. Furthermore, there should be no clinically significant delay in cognitive development or the development of age-appropriate self-help skills, adaptive behavior (other than in social interaction) and curiosity about the environment in childhood. In addition, criteria must not be met for another specific Pervasive Developmental Disorder or Schizophrenia.

1.1.2.2 DIAGNOSTIC PROCESS

Diagnosis of autism encompasses the comprehensive clinical assessment and observation of behavior, as there are no biological markers for autism. The gold standard for autism diagnosis (Levy, Mandell, & Schultz, 2009) includes the use of the Autism Diagnostic Interview-Revised (ADI-R, Lord, Rutter, & Couteur, 1994) and the Autism Diagnostic Observation Schedule (ADOS, Lord et al., 2000). Both the ADOS and the ADI-R provide diagnostic algorithms for autism as described in DSM-IV and ICD-10, which have been shown to represent reliable diagnosis of autism (Bölte & Poustka, 2004; Poustka, Lisch, & Ruhl, 1996).

The ADI-R is a comprehensive, semi-structured interview administered to a parent or caregiver of the autistic individual. The clinical review focuses on behaviors in three content areas: qualities of reciprocal social interaction, communication and language as well as restricted and repetitive, stereotyped interests and behaviors. In addition to examine current behavior, many questions also focus on the age between 4 and 5 years, as this is the

time period when the behaviors typically associated with autism are likely to be most pronounced (Lord et al., 2000). The ADOS is a semi-structured, standardized assessment of social interaction, communication, play and imaginative use of materials. It comprises four different modules, of which one is chosen according to the expressive language of the individual to be assessed. In the diagnostic process for our empirical studies, we used module 4 for individuals with fluent speech. During the assessment, the clinical expert provides planned social occasions (“presses”) to trigger a range of social initiations and responses. Unlike the ADI-R - which is based on retrospective parent report - the ADOS provides a measure of current functioning.

1.1.3 FOCUSING ON STRENGTHS

While traditionally autism research focuses on symptomatology and clinical deficits, a growing number of researchers are demanding a new perspective in autism research. In his widely received comment in *Nature*, Laurent Mottron (2011) argued that researchers should not simply study autistic deficits but rather emphasize abilities and strengths of people with autism and avoid language that frames autism as a defect that has to be corrected. Mottron (2011) underlines that he does not want to minimize the negative impact that autism has on different areas of functioning; rather, he wants to broaden the view to the abilities that autistic individuals have and what they can contribute to science and other areas of work. This is in line with the aim of positive psychology, namely to broaden “the focus of clinical psychology beyond suffering and its direct alleviation’s” by focusing on optimal functioning and well-being, i.e. life satisfaction (Duckworth et al., 2005, p.629). Positive psychology is an umbrella term for theories and research about factors (i.e. emotions, traits, and institutions) that make our lives most worth living (Stodden & Mruzek, 2010) and has been developed as an opposition to the focus on pathology and the development of classification and treatments for various disorders in traditional psychology (Ruch et al., 2010). This approach offers an important additional perspective on aspects of the personality or behaviors of individuals, as “(troubled) persons “want to build their strengths, not just correct their weaknesses”(Duckworth et al., 2005).

1.1.4 TERMINOLOGY

Regarding the terminology describing autism, various influencing researchers have suggested using neutral language to avoid stigmatization of individuals with the condition (Baron-Cohen, Scott et al., 2009; Mottron, 2011) and support the shift towards a more

strength-focused approach. Therefore, in the introduction and discussion of this dissertation, I will use the terms *autism spectrum condition* (ASC) rather than *autism spectrum disorder* as suggested by Baron-Cohen and colleagues (2009). Furthermore, I chose to use the expression *autistic individuals* and *individuals on the autism spectrum* rather than using *individual with autism*. This decision was based upon input of the autistic community (for some references, please see the website of AASPIRE¹) and a study assessing the perspectives of the autistic community in the UK (Kenny et al., 2015) regarding perspectives on different terminology used to describe autism. This study has shown that the term *on the autism spectrum* was highly endorsed by autistic persons, family and friends as well as professionals. Furthermore, the term *autistic individuals* was preferred by the autistic community in comparison to the first-person language expression *individual with autism*: (Jaarsma & Welin, 2012; Kenny et al., 2015; Sinclair, 1999). However, Kenny and colleagues point out that there also is controversy in the autistic community regarding whether to use *first-person-language* (i.e. individual with autism) or *first-disability-language* (i.e. autistic individual). Across the publications (study 1-4) included in this dissertation, the terminology that describes autistic individuals differs, reflecting different preferences among reviewers and a change of diagnostic terminology. Regarding those participants who participated in our studies as control participants, we use the term *neurotypical* to distinguish them from the autistic - i.e. *neurodiverse* - individuals (Walsh, 2013).

1.1.5 PREVALENCE

Despite being considered a rare condition when first described (e.g. 4 out of 10.000 in the UK in the first epidemiologic study (Lotter, 1967)), in recent decades estimations of prevalence rates of ASC have steadily increased (for a systematic review, see Fombonne, Quirke, & Hagen, 2011). Indeed, recent studies estimate the prevalence rates in the population at 1% (Baird et al., 2006; Baron-Cohen et al., 2009; Brugha et al., 2011). There were growing worries of a genuine rise in autism incidences (Fombonne, 2001), however, to date increasing prevalence rates are mostly attributed to growing awareness, an increase in specialized services, changes in diagnostic criteria and the development of the concept of the wide autistic spectrum (Wing & Potter, 2002). In fact, it has been shown that prevalence rates have raised particularly in high-functioning autistic individuals (Keyes et al., 2012).

¹ <http://aaspire.org/?p=about&c=language>

Furthermore, there has also been a shift in the recent past regarding the estimated sex ratio. Revising recent large-scale population studies, Lai and colleagues (2014) resume that 2–3 times more men than women are affected, which is a lower gender ratio than previously suggested (3-4:1) (Volkmar & Pauls, 2003). Baron-Cohen and colleagues (2011) suggest that women might have been under-recognized in the past. The understanding of the impact that the new diagnostic criteria for autism spectrum disorder of the DSM-5 (American Psychiatric Association, 2013) will have on prevalence rates reflects an important research question for the coming years (King, Navot, Bernier, & Webb, 2014).

1.1.6 ETIOLOGY

In the early-1950 to 1970s, the notion of the emotionally cold “refrigerator mother” was popularized by the works of Bruno Bettelheim (1967) and dominated early academic and popular beliefs about the underlying causes of autism. Although his ideas were criticized and contradicted by other professionals at the time (e.g. Rimland, 1964; Wing, 1971), it took immense research effort and many decades to untangle this unfortunate link between parenting and autism. Public fears about a link between autism and vaccination against mumps, measles and rubella (MMR) were raising from the end of the 1990s, especially after the publication of study results suggesting this link (Wakefield et al., 1998). However, this article was retracted from the publishing journal *The Lancet* in 2010 owing to concerns of fraud and misconduct by the authors (The Editors of *The Lancet*, 2010). Subsequent comprehensive studies have shown no link between MMR (Destefano, Price, & Weintraub, 2013; Jain et al., 2015) or other vaccines and autism (McCormick, 2004).

To date, autism is considered as a highly heritable complex neurodevelopmental condition whose etiology is thought to involve “an interaction between genetic susceptibility, mediated by multiple genes, and possible environmental factors, leading to aberrant neurodevelopment” (Moy & Nadler, 2008, p.1). Evidence for the genetic contribution to autism comes - among other evidence - from twin studies in which concordance rates for monozygotic twins are significantly higher than those for dizygotic twins and heritability is more than 90% (Volkmar & Pauls, 2003). However, identifying pathways in between genetics and the different behavioral deficits associated with autism remains an enormous challenge (Lord, 2011).

1.1.7 COMORBIDITIES

There are high rates of comorbidities in ASC, with estimates suggesting that 70% of autistic individuals have a co-occurring medical, developmental or psychiatric condition. Intellectual disability is one of the most current co-occurring conditions and is considered to be present in approximately 45% of autistic individuals. Co-occurring epilepsy (estimates between 8-30%) is often associated with intellectual disability or genetic syndromes. Rates of anxiety (42-56%) and depression (12-70%) are high. While attention-deficit hyperactivity disorder (ADHD) was not diagnosed in DSM-IV in autistic individuals, this limitation no longer applies in DSM-5 and comorbidity is estimated between 28-44%. These estimates of comorbidities are a short extract of the list of comorbidities reported by Lai and colleagues (2014) in their comprehensive review.

1.2 NEUROPSYCHOLOGICAL THEORIES OF AUTISM

Various frameworks have been postulated to explain the symptomatology and neuropsychological characteristics of ASC. In the following, I will first introduce the neuropsychological models of social cognition, executive functions and central coherence. While the social cognition model provides a unified cognitive explanation for the communicative and social core symptoms in autism (Tager-Flusberg, 2007), the theory of executive functioning and central coherence has been suggested to explain the non-social behaviors typically associated with autism, such as restricted repertoire of repetitive and obsessive behaviors or rigidity and perseveration, as well as uneven patterns of intelligence.

More recently, the theory of enhanced perceptual functioning has challenged the theory of central coherence and has suggested a switch in perspective regarding the increased focus on details in autistic individuals. The empathizing-systemizing theory combines two different psychological factors to explain social and nonsocial aspects of autism in one theory. Finally, I briefly summarize research findings regarding savant abilities.

1.2.1 SOCIAL COGNITION

Social cognition refers to all mental processes that the individual uses to make sense of his or her social environment, “including information processing about all people, including the self, and about the norms and procedures of the social world”. (Bauminger-Zviely, 2013, p.2884). There is a huge body of research showing that many aspects of social cognition differ between autistic and neurotypical individuals, such as reduced attention to

social stimuli (Dawson et al., 2004), reduced imitation (Rogers, Hepburn, Stackhouse, & Wehner, 2003), difficulties in encoding social information (Baron-Cohen, 2000), understanding and learning social norms and rules (Rogers & Williams, 2008; Stroebe, Jonas, & Hewstone, 2011).

One of the most prominent concepts within the social cognition model in autism is the theory of mind model. Having a *theory of mind* is the capacity to reflect on the content of one's own and others' minds. This ability includes inferring the full range of mental states (beliefs, desires, intentions, imagination, emotions, etc.) that cause action in oneself or others (Baron-Cohen, 2000). Three decades ago, Baron-Cohen and colleagues (1985) introduced the hypothesis of a theory of mind deficit in autistic individuals, also referred to as mind-blindness theory. In their influencing paper "*Does the autistic child have a theory of mind?*"; Baron-Cohen and colleagues (1985) showed a specific deficit in autistic children regarding a conceptual perspective-taking skill, first introducing the Sally–Ann false belief-task. In this study, children (aged 4) were presented with a cartoon showing the two characters, Sally and Ann. In the scenario, Ann transfers Sally's marble into a box, which Sally had left in her basket before leaving the room. Most typically developed children and those with Down syndrome passed the test by reasoning that Sally would look for the marble in the basket, where she left it. However, most autistic children assumed that Sally would look in the box, failing to draw the second-order conclusion that Sally did not have the knowledge about Ann's action and thus would look in the original place.

A wide body of research studies testing various aspects of theory of mind by applying different tasks (such as false-belief tasks (e.g. Grant, Grayson, & Boucher, 2001), emotion recognition (e.g. Baron-Cohen, Wheelwright, Hill, Raste, & Plumb, 2001), strange story task (e.g. Happé, 1994) or faux pas (Baron-Cohen, Riordan, Stone, Jones, & Plaisted, 1999)) provides evidence that theory of mind deficits is present across the life time in all autistic individuals, albeit at different levels and to varying degrees (Korkmaz, 2011). The conclusion that these deficits in theory of mind specifically - and deviant social cognition processes in general - make it difficult for autistic individuals to navigate within the social world is evident. Autistic individuals are often described as socially insecure, acting strange, not interested socially or even unfriendly or rude (Attwood, 2012). The consequence for the autistic individual is a negative impact on social relationships, as well as other aspects of life such as employment. Social difficulties have been described as a main obstacle in terms of finding and maintaining employment (Hendricks, 2010).

However, there is first evidence that there could be also somehow ‘positive consequences’ of being less sensitive and receptive to social rules and demands. Frith & Frith (2011) and Izuma and colleagues (2011) found autistic individuals to be less prone to manage their reputation in a socially desired way compared to neurotypical controls, hence acting more authentically and honest. Following up on the assumption that deviant processes of social cognition could also have “positive side effects”, in study 2 of this dissertation - which is introduced below (1.3.2.) - we tested the hypothesis of reduced social bias in autistic individuals.

1.2.2 EXECUTIVE FUNCTIONING

The executive functioning model is based upon a more general learning domain (Pennington & Ozonoff, 1996) and postulates a deficit in the management of cognitive processes and the regulation of behavior. The umbrella term executive functioning refers to functions such as planning, working memory, impulse control, inhibition, shifting set and the initiation and monitoring of action. As a common feature, these functions share the need to disengage from the immediate environment to guide actions (Hill, 2004). Studies supporting the executive functioning model have (among others) found autistic individuals to have difficulties in planning (e.g. Ozonoff, Pennington, & Rogers, 1991), mental flexibility (e.g. Ozonoff & Jenson, 1999) and the inhibition of prepotent response (Russell, Hala, & Hill, 2003). As these aspects of cognitive functioning are likely to have an impact on one’s ability to function at the work place, they have to be considered when identifying work tasks and routines for autistic individuals. While the literature predominantly refers to *deficits* in executive functioning, it has been suggested anecdotally that deviant mechanisms in executive functioning could also lead to certain abilities, such as remaining focused on a subject given to a preference to engage in routines and a reduced tendency to switch focus.

1.2.3 CENTRAL COHERENCE

Another cognitive framework for ASC is the central coherence model, which refers to a detail-focused information processing style. The first accounts of the central coherence theory suggested a weak central coherence in autistic individuals (Frith & Happé, 1994). The authors hypothesized autistic individuals to have a core deficit in central processing resulting in a failure to extract global form/meaning. However, the central coherence theory has been reformulated based upon a review of empirical evidence of recent decades revealing robust findings supporting a bias towards local processing and mixed findings regarding weak

global processing (Happé & Frith, 2006). Hence, the updated version of the theory focuses more on strengths associated with this cognitive style and frames the differences between autistic and neurotypical individuals as a bias rather than a deficit. Findings supporting a bias towards local processing include among others higher scores in embedded figure tests (Shah & Frith, 1993) or the block design test (Mitchell & Ropar, 2004), more detailed drawings (Booth, Charlton, Hughes, & Happe, 2003) or fewer visual illusions (Happe, 1996). The central coherence theory has been used to explain certain behaviors associated with autistic symptomatology, such as the tendency to focus on parts of play objects, unusual and intense preoccupations with objects, extreme sensitivity and resistance to trivial changes in the environment and highly circumscribed interests, as well as “islet of abilities” such as peaks in some intelligence subtests (Joseph, 1999). Moreover, in the case of the central coherence model, universality and specificity of the findings for autism also have to be further explored, as well as the influence of general ability.

1.2.4 THEORY OF ENHANCED PERCEPTUAL FUNCTIONING

The theory of enhanced perceptual functioning was originally proposed as an alternative to the original hypothesis of weak central coherence in autistic individuals (Frith & Happé, 1994). While the theory of enhanced perceptual functioning emphasizes the superior low-level perceptual operations as a strength per se, the theory of weak central coherence interprets the local superiority only as a side effect of the difficulties in constructing a *Gestalt* (Mottron & Burack, 2001; Mottron et al., 2006).

The authors have recently revised the theory of enhanced perceptual functioning and postulated eight principles of perception in autism (Mukerji, Mottron, & McPartland, 2013).

1. More locally-oriented perception is the default for individuals in autistic populations relative to typical populations.
2. Neural complexity is inversely related to performance in low-level perceptual tasks.
3. Early atypical behaviors regulate perceptual input.
4. In autism, primary and associative brain regions involved in perception are atypically activated during social and nonsocial tasks.
5. Higher order processing is variable in autism and mandatory in typical development.
6. Perceptual expertise underlies savant syndrome.
7. Savant syndrome is an autistic model for subtyping within pervasive developmental disorder (PDD).

8. Enhanced functioning of perceptual brain regions may contribute to abnormalities in perception in autism.

The authors postulate that the distinct pattern of cognitive, behavioral and neural performance associated with autism is linked to superior function and increased independence of auditory and visual perceptual processes.

1.2.5 THE EMPATHIZING–SYSTEMIZING THEORY

The empathizing-systemizing theory was introduced by Baron-Cohen and colleagues (2009) as a supplement to the mind-blindness theory to account for areas of strengths and explain other non-social characteristics of autistic individuals. According to the empathizing-systemizing-theory, two psychological factors - *empathizing* and *systemizing* - have to be considered for explaining behaviors, cognitive profiles and symptomatology typically associated with autism. According to Baron-Cohen, a system is defined by following rules and by systemizing one attempts to identify the rules of a system and predict their behavior (e.g. mechanical, numeric, collectible system).

The theory postulates the abilities related to systemizing as average or above average in autistic individuals, while empathizing abilities (defined by emotional empathy and theory of mind abilities) are considered to be below average. Baron-Cohen and colleagues (2009) proposed that the excellent attention to detail in autistic individuals is the basis for strong systemizing and linked systemizing to talent. They hypothesized that the common characteristic of autistic talent is the individual becoming “an expert in recognizing repeating patterns in stimuli” (p.1377), which they interpreted as the equivalent to systemizing. Systemizing has also been linked to the development of special interests (Caldwell-Harris & Jordan, 2014). Taken together, the empathizing-systemizing theory tries to incorporate two different psychological factors to explain social and non-social aspects of symptomatology and other characteristics and strengths associated with autism in one theory.

1.2.6 EXCURSUS: SAVANT ABILITIES

Savant abilities have fascinated scientists and the general public since centuries and they are often the first association that comes to people’s mind when hearing about strengths in ASC. Savant abilities often comprise exceptional skills in areas like painting, music, calculating and memory (Bölte, Uhlig, & Poustka, 2002). There are various definitions of savant abilities. The term “idiot savant” - which was first coined by British physician John

Langdon Haydon Down (as read in Miller, 1998) - indicates splitter abilities accompanied by intellectual abilities below average while other definitions of savant abilities emphasize the discrepancy between a normative superior performance in one area and the general level of functioning of the individual (Miller, 1998). Little is known about the prevalence of savant abilities in autistic individuals, given that most studies reporting on savants are case reports. Howlin and colleagues (2009) assessed rates and types of savant skills (via parent reports and intelligence tests) in 137 autistic individuals, finding that 37 per cent of the sample showed either savant skills (based on parent report, mostly mathematical/calculating abilities) or exceptional cognitive skills (Wechsler intelligence test) or both. They estimated that approximately one-third of the autistic population have unusual talent, while estimates reported in other studies are lower (Bölte et al., 2002). The hyper-systemizing theory and the enhanced perceptual functioning theory - which are outlined below - have been used to account for savant abilities, however, up to date only part of the phenomena can be explained. An important question that has not been sufficiently addressed to date is how to help autistic individuals to use these savant skills towards better outcomes in adulthood, e.g. employment. Howlin and colleagues (2009) point out that among their participants only a small number (five individuals out of 137) had succeeded in making use of their special skills in permanent employment.

1.3 STRENGTHS RELATED TO PERSONALITY AND SPECIAL INTERESTS

In this section, I present current knowledge closely related to the focus of this dissertation and briefly introduce the empirical studies 1-3 of this dissertation. In further detail, I summarize knowledge regarding character strengths and briefly outline **study 1**. Subsequently, I review evidence regarding a reduced social bias in autistic individuals and provide an outlook to **study 2**. Finally, I outline previous research regarding special interests in autistic individuals and introduce **study 3**.

1.3.1 CHARACTER STRENGTHS

A source of strengths in autistic individuals understudied until now are those related to personality. Previous research addressing personality traits in autistic individuals has typically focused on deficits and described autistic individuals - for example - as more neurotic and less extraverted, agreeable, conscientious and open to experience than neurotypical individuals (Schriber, Robins, & Solomon, 2014). A new perspective on personality is offered by the concept of character strengths, which is a relatively new

approach towards describing personality, based upon the theoretical framework of positive psychology (Peterson & Seligman, 2004). Character strengths are defined as positively valued trait-like individual differences that manifest in individuals' thoughts, feelings and behaviors across different situations and are considered to be stable over time. Peterson and Seligman (2004) introduced the Values in Action Classification of Strengths (VIA-IS), which comprises 24 character strengths (e.g. *creativity, persistence*) subordinated to six virtues (e.g. *wisdom, humanity*). The VIA-IS has been widely applied in different research contexts including the comparisons of prevalence of character strengths across different cultures (Brdar & Kashdan, 2010; Park, Peterson, & Seligman, 2006; Shimai, Otake, Park, Peterson, & Seligman, 2006) and different groups (e.g. *sex*, Brdar, Ani, & Rijavec, 2011 or *occupations*, Littman-Ovadia & Lavy, 2012). In addition, associations of character strengths with satisfaction with life (Park et al., 2004; Peterson, Ruch, Beermann, Park, & Seligman, 2007), work satisfaction (Harzer & Ruch, 2012, 2013), academic achievement (Lounsbury, Fisher, Levy, & Welsh, 2009), health (Proyer, Gander, Wellenzohn, & Ruch, 2013), post-traumatic growth (Peterson, Park, Pole, D'Andrea, & Seligman, 2008), mindfulness (Niemiec, Rashid, & Spinella, 2012) and many other variables have been studied. A comprehensive overview of research related to character strengths can be found on the website of the VIA Institute on Character².

Samson and Antonelli (2013) first compared VIA-IS character strengths of autistic and neurotypical individuals, reporting lower scores of autistic individuals in *emotional* and *interpersonal* character strengths but comparable results in both groups in terms of *intellectual strengths* and *strengths of restraint*. However, it was suggested that especially in vulnerable populations an individual strength-based approach would also be useful, hence examining an individual's strengths relative to his/her other strengths of character rather than to a norm population (Park & Peterson, 2009). The *signature strengths* - which are the top-ranked strengths in one's strength ranking and are considered to be the most salient to a person (Park et al., 2004; Peterson & Seligman, 2004; Ruch et al., 2010) – hold special interest within this approach. It has been shown that the exercise of signature strengths is perceived as particularly fulfilling (Seligman, Steen, Park, & Peterson, 2005) and the application of signature strengths at the work place is associated with positive experiences at work (Harzer & Ruch, 2013). Furthermore, there is robust evidence in neurotypical

² <http://www.viacharacter.org/www/Research/Research-Findings>.

individuals that character strengths are associated with life satisfaction (Park et al., 2004, 2006; Ruch et al., 2010). However, groups seem to differ (e.g. different cultures/occupations/gender) regarding which character strengths are the most strongly associated with life satisfaction (Littman-Ovadia & Lavy, 2012; Peterson et al., 2007; Shimai et al., 2006); hence, information concerning how aspects of personality are related to satisfaction with life can provide important information for interventions targeting well-being in individuals of a certain group. These associations are especially interesting in autistic individuals, as reflected by evidence of decreased levels of satisfaction with life and increased rates of depression (Jennes-Coussens, Magill-Evans, & Koning, 2006; Kamp-Becker, Schröder, Remschmidt, 2010; Lai et al., 2014), although little research effort has been undertaken to shed light on the underlying mechanisms.

In study 1 of this dissertation, my co-authors and I assessed VIA-IS character strengths in high-functioning autistic individuals with a focus on signature strengths and examined associations between character strengths and satisfaction with life.

1.3.2 REDUCED SOCIAL BIAS

Another potential strength related to the personality of autistic individuals might be reduced levels of social bias in the form of reduced stereotypical attitudes. Stereotypes are simplified conceptions, considered core elements in a person's social knowledge (Fazio and Olson 2003) that influence the processing of social information in a substantial way; for example, by allowing for time-economic decision-making. However, the use of stereotypes can also be mischievous in the form of prejudice against other individuals. It has been suggested that autistic individuals are free of stereotypes (Hamilton & Krendl, 2007) and "sexist [...] or culturalist biases" (Attwood & Gray, 1999), given that social learning that underlies the acquisition of stereotypes (Stroebe et al., 2011) is impaired in autistic individuals starting from young age (Bushwick, 2001). Contrary to this hypothesis, previous studies found autistic individuals to use stereotypes to the same extent as neurotypical controls, which was interpreted as a social resource and an "islet of ability" (Da Fonseca, Santos, Rosset, & Deruelle, 2011; Hamilton & Krendl, 2007; Hirschfeld, Bartmess, White, & Frith, 2007). However, those studies used explicit measures such as asking the participants directly to make judgements on people based upon group membership (Da Fonseca et al. 2010; Hirschfeld et al. 2007; White et al. 2006). The question concerning how the results are biased towards a socially desired answering behavior remains open. Even though the management of reputation in a socially desired way seems to be reduced in autistic

individuals (Frith & Frith, 2011; Izuma et al., 2011), the social desirability bias still needs to be considered in autism research, given that meaningful differences between groups can be shadowed if autistic and neurotypical individuals differ in their extent of responding in a socially desired way. As the assessment of stereotypes and prejudice is strongly affected by the tendency to present oneself in a socially desired way (Franco & Maass, 1999), Fazio & Olson (2003) suggest applying implicit - rather than explicit - measures, as they can provide estimates of the construct of interest, which are likely to be free of social desirability concerns.

For the purpose of assessing automatic components of stereotype - which are less likely to be controlled and biased intentionally - the Implicit Associations Test (IAT) has been developed (Greenwald, McGhee, & Schwartz, 1998) and is one of the most frequently used implicit measures for automatic stereotypical attitudes. The IAT is a computerized classification paradigm that involves fast classification of concepts (e.g. names have to be classified as either German or Turkish) and emotionally-valent stimuli (e.g. *pleasure* or *disaster*, which have to be classified as either *positive* or *negative*). The different combinations of these two tasks is distinguished as a compatible and incompatible condition (if individuals have stronger associations between German names and positive words compared to Turkish names and positive names, the first combination would be the congruent condition and the second one the incongruent condition). The performance difference between the compatible and incompatible condition is interpreted as the IAT effect, whose magnitude is interpreted as reflecting the degree of automatic stereotypes. To our knowledge, there have been no previous research studies applying an IAT in autistic populations.

In study 2 of this dissertation, we assessed social bias in the form of automatic stereotypes towards German and Turkish people in autistic adults with an IAT (Klauer, Schmitz, Teige-Mocigemba, & Voss, 2010).

1.3.3 SPECIAL INTERESTS

Special interests have been suggested as an important source of competencies and motivation in high-functioning autistic adults. Asperger (1944) already claimed in his first descriptions that special interests can lead individuals with the syndrome to outstanding achievements in their chosen areas. Special interests are not identical with savant skills (outlined above, 1.2.6.), although depending on the definitions applied there is an overlap

between the two concepts. Special interests are unusual or atypical in their intensity and/or content and represent a typical manifestation of the restricted repetitive and stereotyped patterns of behavior, interests and activities in high-functioning autistic adults (Klin, Danovitch, Merz, & Volkmar, 2007). Topics of the special interests can cover a vast range; for example, transport systems, schedules, historical events, sports, numbers, calculations or animals (Asperger, 1944; Caldwell-Harris & Jordan, 2014; Klin, Danovitch, Merz, & Volkmar, 2007; Winter-Messiers, 2007). Jordan and Caldwell-Harris (2014; 2012) have suggested using the term *special interests* rather than *restricted*, *circumscribed* or *obsessive interests*, as the term *special interests* promotes a strength-based approach and is also widely used within the autistic community.

Even though special interests have been estimated to exist in 90% of individuals with Asperger syndrome (Attwood, 2003), special interests remain an understudied area in autism research: the small number of studies becomes especially obvious when compared to the vast body of literature concerning other characteristics of autistic individuals (e.g. social symptomatology) (Grove, Roth, & Hoekstra, 2015). The lacking research interest to date is especially surprising under the light of high unemployment rates in high-functioning autistic individuals, as the potential of special interests for employment opportunities has often been suggested (Attwood, 2003; Eve, Schuler, Burton, & Yates, 2003; Koegel, Kim, Koegel, & Schwartzman, 2013). Reviewing evidence-based research related to employment for individuals with ASC, Hendrick (2010) also underlines the importance of the careful match between the requirements of the job to the interests and strengths of the individual. Furthermore, special interests are often sources of positive emotions, such as enthusiasm, pride and happiness and engaging in those activities can reduce levels of stress and anxiety (Winter-Messiers, 2007).

The few existing studies addressing special interests have mainly focused on children (e.g. Baron-Cohen & Wheelwright, 1999; Winter-Messiers, 2007). In a recent study, Jordan and Caldwell-Harris (2012) have analyzed discussions in internet forums of high-functioning autistic adults to contribute to the characterization of phenomena. However, relevance of the special interest for employment has not been discussed.

To advance the knowledge in this area, **in study 3 of this dissertation**, my co-author and I describe an empirical study that we conducted aiming to gain a better understanding of special interests relevant for vocational use in high-functioning autistic individuals. For this purpose, we developed a new questionnaire to assess the approach with which the special

interest is pursued, the field of the special interest and level of proficiency in the special interest. The study was conducted in cooperation with Dirk Müller-Remus, who at the time was preparing the start-up of a company seeking to develop jobs for individuals on the autism spectrum³. In line with the ideas of community-based participatory research, the questionnaire was developed in cooperation with a focus group of high-functioning autistic individuals who provided feedback on items and the design of the questionnaire to ensure the accessibility, respect, inclusion and relevance of the items.

1.4 INCLUSION AND OUTCOMES FOR AUTISTIC ADULTS

In this section, I will introduce the concept of inclusion and review evidence regarding social outcomes in autistic adults. This is followed by a section covering employment in autistic adults, based upon which I introduce additional research questions of **study 3** and outline **study 4**, respectively.

1.5 INCLUSION

Cappo (2002) defined a socially inclusive society as one in which all people feel valued, their differences are respected and their basic needs are met, whereby they can live in dignity. By contrast, he defines social exclusion as the process of being shut out from the social, economic, political and cultural systems that contribute to the integration of a person into the community (as read in Edwards, 2010). The United Nations have emphasized the inclusion of handicapped persons as a mandatory human right in the Convention on the Rights of Persons with Disabilities (United Nations, 2006). The convention underlines the right of disabled individuals towards (among others) adequate health care, habilitation and rehabilitation services, work and employment, adequate standard of living, participation in cultural life, recreation, leisure and sport.

In line with this is the following quote from Laurent Mottron (2011, S. 35):

“The hallmark of an enlightened society is its inclusion of non-dominant behaviours and phenotypes, such as homosexuality, ethnic differences and disabilities. Governments have spent time and money to accommodate people with visual and hearing impairments,

³ By now, Dirk Müller-Remus founded auticon, a company specialized in software testing and developing IT solutions which is currently employing more than 50 high-functioning autistic individuals as IT consultants.

helping them to navigate public places and find employment, for instance — we should take the same steps for autistics.”

An important indicator towards successful inclusion for autistic adults are social outcomes like independent living and social relationships outside the family and employment. In this dissertation, there is a special focus on employment as one of the most important components of adult life, which increases “an individual’s social status and financial independence and maintains a person’s physical and psychological health, thereby improving his/her quality of life” (Chen, Leader, Sung, & Leahy, 2014, p.116).

1.5.1 SOCIAL OUTCOMES IN ADULTHOOD

Studies reporting on social outcomes in autistic adults usually focus on levels of education, employment, the degree of independent living, daily activities and social relationships. Howlin and Moss (2012) compared follow-up studies on adults with autism (with mixed IQ range) conducted between 1967 and 1999 and those between 2000 and 2011, affirming that even though the prospects for young children with ASC have markedly improved in recent decades - including early diagnosis, treatment and services for families - outcomes in adulthood have not yet changed to the expected extent. They found the mean percentage of having a good to very good outcome⁴ across studies between 2000 and 2011 as below 20%, indicating that most autistic adults remain dependent on their families or public services, are unemployed and have few social relationships. However, more autistic adults lived independently from their parents and very few were institutionalized compared to earlier studies, which are first signs of better inclusion. IQ and language abilities at young age were identified as strongest predictors for positive outcomes in adulthood (Howlin & Moss, 2012; Levy & Perry, 2011) but little is known about which other factors contribute to positive outcomes in adulthood. Under the light of high “good outcome” rates in a study conducted by Farley and colleagues (Farley et al., 2009) (N = 48, mixed IQ, 17 % poor / 34 % fair / 48 % good), it has been suggested that strong community support might be an important factor to achieve good outcomes, given that most of the autistic participants in this

⁴ To achieve higher comparability across studies reporting different outcome measures, from the 1970es on, many authors used a coding system, rating the social outcome as “(very) poor” (e.g. specialist residential accommodation), “fair” (e.g. some degree of independent living or job), “good-very good” (e.g. moderate to high levels of independence in living and job) (e.g. Lotter, 1978). While these ratings were often highly subjective, especially in early outcomes studies, later studies have tried to establish ratings on more objective scores, such as composite scores derived from levels of independence, occupational status, and friendships or social relationships (Howlin & Moss, 2012).

study belonged to a relatively enclosed Christian community (the Church of Jesus Christ of Latter Day Saints), through which they participated in many community activities.

Studies focusing on outcomes especially in high-functioning autistic adults are very limited and the numbers of participants are low. However, the available data suggests that among autistic individuals with average or high intellectual abilities, only a very limited number achieve good outcomes. For example, Engstrom (2003) et al. reported that 75% of participants with Asperger Syndrome (N= 16) have fair outcomes and 12% of participants have (very) poor or (very) good outcomes. Cederlund et al. (2008) found that 27% of Asperger participants (N=70) have achieved good outcomes in adulthood and 47% fair outcomes, with 23% achieving restricted and 3% very poor outcomes. Regarding specific autistic symptomatology, Levy and Perry (2011) summarized in their review that severity often declines in adulthood and most individuals show an improvement in their communication, social interaction and pattern of restricted and repetitive behaviors by late adolescence.

1.5.2 EMPLOYMENT

Employment and the resulting job-related social status and increased financial independence is one of the most central outcomes for adulthood and as such also for autistic adults (Gerhardt & Lainer, 2011). However, lack of employment, dissatisfaction with the job and underemployment (work that is not commensurate with an individual's inherent qualifications and skills/not adequate to the status of education) are among the crucial problems for (high-functioning) autistic individuals (Riedel, 2015; Roux et al., 2013). In fact, support with finding and keeping employment is one of the key issues that parents and affected individuals highlight as being crucial for the transition from adolescence to adulthood (Barnard, Harvey, Potter, & Prior, 2001; Neary, Gilmore, & Ashburner, 2015; Shattuck, Narendorf, et al., 2012).

Despite consensus among researchers that employment is one of the key outcomes in autism to be addressed in the future (Hendricks, 2010; Taylor & Seltzer, 2011), no representative data regarding (un)employment rates for autistic individuals exist. Hendricks (2010) resumed in his review on employment in adults with ASC that approximately 50-70% of autistic adults are unemployed. The United Nations have emphasized the inclusion of handicapped persons as a mandatory human right and the lack of productivity due to unemployment has been reported as the most important factor contributing to estimated

lifetime societal costs (per person with autism of \$3.2 million in the USA) (Ganz, 2007). Many researchers pinpoint the transition from teenage to adulthood as the crucial time point when autistic individuals lose track relative to their peers. Therefore, Shattuck and colleagues (2012) claimed that tailored services and assistance should be provided for all autistic teenagers to support them in their transition to adulthood and beyond. However, the German health and social care systems and those of other countries are not adequately prepared for the proper support of these individuals to date.

Despite initiatives and programs showing that employment services lead to higher employment rates (Hendricks, 2010; Howlin, Alcock, & Burkin, 2005; Mawhood & Howlin, 1999), systematic effectiveness studies that meet the criteria of experimental intervention designs are lacking (Westbrook et al., 2012). Mawhood & Howlin (1999) found that 63% of 30 high-functioning autistic individuals are employed after taking part in a supported employment program and receive support with job finding, work preparation and communication with employers, compared to 25% in a high-functioning autistic control group (n=20) without support. Furthermore, positive long-term effects were shown by Howlin and colleagues (2005), who found that 68% of the participants held employment eight years after participating in a supported employment program. Another recent development is the growing number of companies in the information technology sector that successfully employ high-functioning autistic individuals (e.g. Specialisterne (Denmark), Passwerk (Belgium), auticon (Germany)), offering job coaching at the work place to overcome social (and other) problems. However, the understanding of the specific needs of individuals with ASC and the systematic implementation into adequate support tools remain insufficient and only few autistic individuals have access to the existing programs.

It has been suggested that especially individuals with high-functioning autism fall through the crack of the system, given that they do not fit into typical programs for disabled individuals (Baumgartner, Dalferth, & Vogel, 2009; Taylor et al., 2012). High-functioning autistic individuals often have difficulties obtaining and/or maintaining adequate work positions, probably due to autistic specific symptomatology. In fact, there is evidence that autistic individuals often encounter problems at the workplace, which is not associated with a lack of professional skills but rather it is linked to autistic symptomatology. Self-reports suggest that rather social demands and interaction in the “neurotypical” world often create problems at the work place for autistic individuals rather than actual job duties (Hendricks, 2010; Müller, Schuler, Burton, & Yates, 2003). Furthermore, it has been suggested that

sensory sensibilities can cause distraction or discomfort at the workplace among autistic individuals. However, a systematic assessment of this impairing factors does not exist. In order to develop support systems that accompany autistic individuals during the process of finding and maintain employment, information on these factors is crucial.

In study 3 of this dissertation, we assessed factors interfering with work performance and those that facilitate work performance in high-functioning autistic individuals (in addition to special interests relevant for vocational use, as outlined above). Building upon this, **in study 4 of this dissertation** my co-authors and I reviewed evidence towards the need of supported employment programs (SEP) for high-functioning autistic individuals in Germany and proposed an outline for such a SEP.

1.6 AIMS OF RESEARCH

Autism is primarily defined by its clinical symptomatology, whereas strengths associated with the condition have only recently received more attention in research. While various theoretical frameworks have been published in recent decades to describe strengths related to a specific cognitive style in high-functioning autistic individuals, only little research has focused on other strengths such as those related to the personality or special interests. Especially under the light of unsatisfying social outcomes such as high unemployment rates, a better understanding of strengths in this population is strongly warranted to facilitate inclusion efforts.

Thus, the aim of the first part of this dissertation was to advance the knowledge regarding strengths related to the personality in high-functioning autistic adults. Towards this aim, we used the Values in Action Classification of Strengths (VIA-IS) to assess character strengths (study 1) and tested the hypothesis of reduced social bias by assessing automatic stereotypes against minorities with an Implicit Association Test (IAT) (study 2).

The aim of the second part of this dissertation was the better understanding of factors contributing to successful employment in high-functioning autistic individuals. For this purpose, a questionnaire was developed to assess special interests with a focus on vocational use and factors deemed important for vocational performance (study 3). The results of this study were vital in the subsequent development of the outline of a supported employment program (SEP) towards a better inclusion of high-functioning autistic individuals in the job market (study 4).

The specific aims of this dissertation were as follows:

Part I: Strengths related to Personality

Study 1: Character Strengths in High-functioning Individuals with Autism Spectrum Conditions

Specific Aim: To profile character strengths in high-functioning autistic individuals and neurotypical controls and clarify the associations between character strengths and life satisfaction.

Study 2: Stereotypes in Autism Revisited

Specific Aim: To test the hypothesis of reduced use of automatic stereotypes towards an ethnic minority in high-functioning autistic individuals compared to neurotypical individuals.

Part II: Towards Employment

Study 3: Toward the Successful Employment of Adults with Autism: A First Analysis of Special Interests and Factors Deemed Important for Vocational Performance

Specific Aim: To assess special interests that are relevant for employment in high-functioning autistic individuals, as well as identifying factors that are considered important for optimal work performance.

Study 4: Toward the Development of a Supported Employment Program for Individuals with High-functioning Autism in Germany

Specific Aim: To revise evidence regarding the importance of supported employment programs (SEPs) for high-functioning autistic adults in Germany and other countries, as well as outlining a scheme of such a SEP.

2 Part I. STRENGTHS RELATED TO PERSONALITY

2.1 STUDY 1: CHARACTER STRENGTHS IN HIGH-FUNCTIONING INDIVIDUALS WITH AUTISM SPECTRUM CONDITIONS⁵

2.1.1 ABSTRACT

In the current study, we assessed character strengths in individuals with autism spectrum condition (ASC, n = 32) and neurotypical controls (n = 32) using the Values in Action Inventory (VIA-IS, Peterson & Seligman, 2004) and explored associations with levels of satisfaction with life. While the signature strengths profile, i.e., top-ranked strengths within an individual's strengths ranking, comprised mostly *emotional (humour, love)* and *interpersonal strengths (kindness, fairness)* in the neurotypical group, the signature strengths profile in the ASC group was mostly characterized by *intellectual strengths (open-mindedness, creativity, love of learning)*. *Interpersonal* and *emotional strengths* had, however, the highest positive associations with satisfaction with life in the ASC group.

⁵ Study 1 is a pre-print version: The publishers version can be found here:

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2.1.2 INTRODUCTION

Autism spectrum disorder (ASD) is defined by persistent deficits in social communication and social interaction across multiple contexts and restricted, repetitive patterns of behaviour, interests, or activities; symptoms must be present in the early developmental period (DSM-5, American Psychiatric Association, 2013). Prevalence estimations have steadily increased (Wing & Potter, 2002) since the first description of autism (Kanner, 1943) and recent prevalence studies estimate approximately 1 out of 100 individuals to be on the autism spectrum (Baird et al., 2006; Brugha et al., 2011). ASD is defined as a medical disorder and is characterized by clinically significant impairment in social, occupational, or other important areas of current functioning. However, in the last decades, the interest in studying not only symptoms and deficits but also resources and strengths in individuals with ASD has grown. This is especially relevant because outcomes (e.g. satisfaction with life, employment, independent living, daily activities, social contacts) in adults with ASD are often poor (Barneveld, Swaab, Fagel, van Engeland, & de Sonnevile, 2014; Howlin & Moss, 2012; Kirchner & Dziobek, 2014; Lin, Yu, & Yu, 2012; Riedel, 2015) and rates of comorbid depression are high (Howlin & Moss, 2012; Lehnhardt et al., 2012; Levy & Perry, 2011). Strengths-focused research can inform interventions targeting improvements of outcomes in adults with ASD.

To support the shift from a deficit-oriented research approach towards a more strength-focused approach, several authors have suggested the use of the more neutral term 'autism spectrum condition' (ASC) and to avoid language that frames autism as a defect (Baron-Cohen et al., 2009; Mottron, 2011). We follow this suggestion and use the more neutral term ASC in the following.

Strengths in ASC have been described so far in three different contexts: 1) abilities related to a specific cognitive style, 2) skills related to special interests and 3) positive aspects related to personality and character. Various theories, such as the Empathizing-Systemizing Theory (Baron-Cohen, 2009) and the Theory of Enhanced Perceptual Functioning (Mottron et al., 2006) have postulated a specific cognitive style in individuals with ASC to explain special abilities (e.g. superior abilities in inferring physical causality (Baron-Cohen, Richler, Bisarya, Gurunathan, & Wheelwright, 2003; Baron-Cohen, Wheelwright, Spong, Scahill, & Lawson, 2001), superior skills in block design and embedded figures (for a review see Happé & Frith, 2006), specific intelligence profiles (Dawson et al., 2007), or enhanced performance on visual search tasks (Gonzalez, Martin, Minshew, & Behrmann, 2013)). These theories

have also been taken to explain savant skills in individuals with ASC (Baron-Cohen, Ashwin, Tavassoli, & Chakrabarti, 2009; Happé & Vital, 2009); however, they can only partly explain these phenomena.

Another source of strengths in individuals with ASC are special interests (see Caldwell-Harris & Jordan, 2014 and Kirchner & Dziobek, 2014 for an assessment of special interests in adults with ASC), which have been estimated to be present in 90% of individuals with Asperger's syndrome (Attwood, 2003). Already Hans Asperger claimed in his first descriptions in 1944 that special interests can lead individuals with the syndrome to outstanding achievements in their chosen areas (Asperger, 1944).

In the current paper, we sought to address a third area of potential strengths in individuals with ASC, namely those related to personality characteristics. There are anecdotal descriptions of individuals with ASC having certain strengths associated with their personality, such as being fair, authentic and reliable (Preißmann, 2014). Also Tony Attwood (1999) described individuals with ASC as loyal friends who speak their mind “irrespective of social context or adherence to personal beliefs”, are free of sexist, ageist, or culturalist biases and have an inherent determination to seek the truth.

There have been attempts to describe personality beyond mere psychopathology in individuals with ASC (Ozonoff, Garcia, Clark, & Lainhart, 2005; Schriber et al., 2014; Soderstrom, Rastam, & Gillberg, 2002; Strunz et al., 2014); however, the focus is often on weaknesses rather than strengths. For example, Schriber and colleagues (2014) compared self-reports of Big Five personality traits and found individuals with ASC to be more neurotic and less extraverted, agreeable, conscientious and open to experience than neurotypical individuals.

A new perspective on personality is taken by positive psychology, which offers a theoretical framework to study character strengths as supplement to the study of deficits and disorders in traditional psychology (Park & Peterson, 2009). In detail the model of character distinguishes 24 character strengths organized around six virtues (Peterson & Seligman, 2004). Character strengths are defined as positively valued trait-like individual differences, which manifest in individuals' thoughts, feelings, and behaviours across different situations and are stable over time. The Values in Action Inventory of Strengths (VIA-IS, Peterson & Seligman, 2004; Ruch et al., 2010) has been introduced to assess strengths of character on a broad level and validated in a variety of settings. The 24 strengths can be ranked for each

individual with respect to how central they are to the person. Most people develop up to seven such “signature strengths“. Activities that allow the use of the individual signature strengths are expected to be fulfilling and most valued (Peterson & Seligman, 2004). Interventions to increase the use of one’s signature strengths lead to increases in wellbeing (Gander, Proyer, Ruch, & Wyss, 2012; Seligman et al., 2005) and to perceiving one’s work as calling (Harzer & Ruch, 2015).

In a first study comparing individuals with ASC and neurotypical controls regarding their character strengths with the VIA-IS, Samson and Antonelli (2013) found the ASC group to score lower on *emotional* (e.g. *social intelligence, love*) and *interpersonal* (e.g. *teamwork, kindness*) character strengths but as high on *intellectual strengths* (e.g. *creativity, love of learning*) and *strengths of restraint* (e.g. *persistence, authenticity*) as the control group, providing first evidence for the assumption that *intellectual strengths* and *strengths of restraint* are relative strengths in individuals with ASC. However, rather than only comparing magnitudes of character strengths of individuals with ASC to a norm population (Samson & Antonelli, 2013), it was suggested that in vulnerable populations it is more warranted to examine an individual’s strengths relative to his/her other strengths of character (Park & Peterson, 2009). With this individual strength-based approach, the focus is on those strengths which the individual possesses rather than on differences from others. In particular, the top-ranked strengths in one’s strength ranking, also referred to as *signature strengths*, have received growing research attention, as they are considered to be the most salient to a person (Harzer & Ruch, 2013; Park et al., 2004; Peterson & Seligman, 2004; Ruch et al., 2010).

Another influential line of research regarding character strengths provides growing empirical evidence in neurotypical individuals that the endorsement of character strengths is positively associated with satisfaction with life (Brdar et al., 2011; Littman-Ovadia & Lavy, 2012; Park et al., 2004; Peterson et al., 2007; Ruch et al., 2010) and training those character strengths which were associated with satisfaction with life (compared to others which were not) has been shown to improve satisfaction with life (Proyer, Ruch, & Buschor, 2013). However, groups of individuals (e.g. different cultures/occupations/genders) seem to differ regarding which character strengths are most strongly associated with life satisfaction (Littman-Ovadia & Lavy, 2012; Peterson et al., 2007; Shimai et al., 2006): hence, information on how aspects of personality are related to satisfaction with life can be important for interventions that aim to improve well-being in individuals from a certain

group. However, to date, it remains unclear whether character strengths are related to satisfaction with life to a comparable extent in individuals with ASC, as Samson and Antonelli (2013) found only one character strength, i.e., *hope*, to be associated with satisfaction with life in individuals with ASC.

Taken together, the Values in Action Inventory is a new approach to characterize individuals independently from psychopathological concepts. Examining individual strengths rankings with a focus on *signature strengths* puts the emphasis on the resources of an individual rather than the deficits. While in neurotypical individuals there is evidence that exercising one's character strengths can improve satisfaction with life, the understanding of the relationship between character strengths and satisfaction with life in individuals with ASC has still to be broadened.

In the current study we therefore (1) assessed character strengths in individuals with ASC and neurotypical controls, (2) examined which character strengths are most often *signature strengths* in individuals with ASC and explored differences to neurotypical controls and (3) explored associations between character strengths and satisfaction with life in individuals with ASC and neurotypical controls.

2.1.3 METHODS

Participants

Thirty-two adults with ASC without accompanying intellectual impairment and 32 matched neurotypical controls were included in the study. Subjects with ASC were recruited through the autism outpatient clinic of the Charité – University Medicine Berlin or were referred by specialized cooperating clinicians. All participants were diagnosed with an autism spectrum disorder according to DSM-IV (American Psychiatric Association, 2000) using the Autism Diagnostic Observation Schedule (ADOS, Bölte & Poustka, 2004; Lord et al., 2000) and a semi-structured clinical interview based on the Diagnostic and Statistical Manual of Mental Disorders, 4th edition (DSM-IV-R, American Psychiatric Association, 2000). Final diagnoses were established by expert consensus, taking into account the clinical interview, observation and scale assessment. The ASC group and the control group did not differ significantly regarding sex, age, education or status of employment. For demographic data, see Table 1.

Table 1. Demographics

	ASC	Control	<i>p</i>
Gender (male/female)	21/11	20/12	.79 ^b
Age (years)	30.9 ± 8.4	30.9 ± 8.4	.99 ^a
Education (years)	14.0 ± 2.9	13.8 ± 2.9	.70 ^a
Currently working (Yes/No)	11/21	12/20	.79 ^b
Satisfaction with Life (SWLS)	2.9 ± 1.2	4.5 ± 1.4	.00 ^a

p values reflect level of significance from t-test for independent samples^a and chi-square^b. Values are given in mean ± SD. SWLS Satisfaction with Life Scale

Measures

The *Values in Action Inventory of Strengths* is a self-report questionnaire assessing 24 character strengths, which can be assigned to five factors, namely *emotional* (e.g. *zest, hope*), *interpersonal* (e.g., *kindness, leadership*), *intellectual* (e.g., *curiosity, creativity*), and *theological strengths* (e.g. *gratitude, spirituality*), as well as *strengths of restraint* (e.g. *persistence, self-regulation*) (Ruch et al., 2010). Each scale consists of ten items. Items are rated using a five-point Likert scale (1 = “very much unlike me” to 5 = “very much like me”). An example item for the character strength *persistence* is “I never quit a task before it is done”. Mean scores for the scales are calculated. In this study, the German version of the VIA-IS was used (Ruch et al., 2010). It proved to be reliable and valid: internal consistencies of the scales ranged from .71 (honesty) to .90 (spirituality), and the median was $\alpha = 0.79$ (Ruch et al., 2010). For the VIA-IS character strengths and descriptions, see Table 2.

Table 2. The 24 Character Strengths included in the Values in Action Classification of Strengths (VIA-IS) and short descriptions

Emotional Strengths	
(VIA 9)	Zest (<i>enthusiasm</i>): Approaching life with excitement and energy
(VIA 22)	Hope (<i>optimism</i>): Expecting the best and working to achieve it
(VIA 6)	Bravery (<i>courage</i>): Not shrinking from threat, challenge, difficulty or pain
(VIA 23)	Humour (<i>playfulness</i>): Liking to laugh and joke, bringing smiles to other people
(VIA 10)	Love: Capacity to love and be loved, valuing close relations with others
(VIA 12)	Social Intelligence: Being aware of the motives and feelings of self and others, knowing what to do to fit into different social situations
Interpersonal Strengths	
(VIA 11)	Kindness (<i>generosity</i>): Doing favours and good deeds for others, helping others and taking care
(VIA 13)	Teamwork: Working well as a member of a group or team, being loyal to the group
(VIA 14)	Fairness: Treating all people the same according to notions of fairness and justice
(VIA 15)	Leadership: Taking care of a group and its members, organizing activities and seeing that they happen
(VIA 16)	Forgiveness: Forgiving those who have done wrong, giving people a second chance
(VIA 17)	Modesty: Letting one's accomplishments speak for themselves, not regarding oneself as more special than one is
Intellectual Strengths	
(VIA 1)	Creativity (<i>originality</i>): Thinking of novel and productive ways to do things, including but not limited to artistic achievements
(VIA 2)	Curiosity (<i>interest</i>): Taking an interest in all of ongoing experience, findings subjects and topics fascinating, exploring and discovering
(VIA 3)	Open-Mindedness (<i>judgement</i>): Thinking things through and examining them from all sides, not jumping to conclusions; being able to change one's mind in light of evidence
(VIA 4)	Love of Learning: Enjoyment of mastering new skills, topics, and bodies of knowledge
Strengths of Restraint	
(VIA 7)	Persistence (<i>perseverance</i>): Finishing what one starts, persisting in a course of action in spite of obstacles
(VIA 18)	Prudence: Being careful about one's choices; not saying or doing things that might later be regretted
(VIA 19)	Self-regulation: Regulating what one feels and does
(VIA 5)	Perspective: Being able to provide wise counsel to others, having ways of looking at the world that make sense to oneself and to other people
(VIA 8)	Authenticity (<i>honesty</i>): Speaking the truth and presenting oneself in a genuine way
Theological Strengths	
(VIA 24)	Spirituality (<i>religiousness</i>): Having coherent beliefs about the higher purpose and meaning of life
(VIA 21)	Gratitude: Being aware of and thankful for the good things that happen
(VIA 20)	Appreciation of beauty: Noticing and appreciating beauty, excellence, and/or skilled performance in all domains of life

The *Satisfaction with Life Scale* (SWLS, Diener, Emmons, Larsen, & Griffin, 1985) is a five-item instrument measuring global life satisfaction. The SWLS is widely used in research and has shown good psychometric properties (Pavot & Diener, 1993). Items are rated using a seven-point Likert scale (1 = “strongly disagree” to 7 = “strongly agree”). An example item is “I am satisfied with my life”. A mean score is calculated.

Procedure

Participants with ASC were invited to complete the questionnaires using an online survey and received 15 € for participation in the study. A control group which was matched for gender, age, and education was randomly selected from a large data pool which were collected through the website www.charakterstaerken.org hosted by the University of Zurich. All questionnaires were completed anonymously. All parts of the study were conducted according to the declaration of Helsinki and following local ethical standards. All subjects provided written informed consent. Statistical analyses were performed with the statistical software IBM SPSS 22.

2.1.4 RESULTS

Group comparisons mean scores VIA-IS

Mean scores for the 24 scales of the VIA-IS were computed for both groups. To explore group differences regarding the strengths profile of the two groups, we computed multivariate analysis of variance with scales of the VIA-IS as dependent variables and group as the fixed factor. All assumptions for conducting a MANOVA were met. Accounting for multiple testing, corrected levels of significance were administered using the false discovery rate procedure proposed by Benjamini and Hochberg (1995). A corrected level of significance of $q < .03$ was considered as significant. There was a significant main effect of group, indicating that individuals with ASC and controls differed regarding their profile of character strengths $F(24, 39) = 5.36, p < .001$; Wilk's $\Lambda = 0.23$, partial $\eta^2 = .77$. Comparing the individual strengths, we found individuals with ASC to score significantly lower than controls on most emotional and interpersonal strengths, but not on the majority of intellectual strengths and strengths of restraint. For a full display of results, see Table 3

Table 3. Character strengths in individuals with ASC and neurotypical control individuals

Emotional Strengths			M	SD	95% CI	p	Intellectual Strengths			M	SD	95% CI	p
(VIA 9)	Zest	ASC	2.91	0.72	[2.66, 3.16]	.004*	(VIA 1)	Creativity	ASC	3.51	0.63	[3.27, 3.75]	.645
		Control	3.43	0.68	[3.18, 3.68]				Control	3.43	0.72	[3.19, 3.67]	
(VIA 22)	Hope	ASC	2.85	0.78	[2.57, 3.13]	.004*	(VIA 2)	Curiosity	ASC	3.25	0.69	[3.02, 3.47]	.005*
		Control	3.44	0.79	[3.16, 3.71]				Control	3.72	0.59	[3.49, 3.95]	
(VIA 6)	Bravery	ASC	3.15	0.65	[2.93, 3.38]	.103	(VIA 3)	Open-Mindedness	ASC	3.73	0.60	[3.52, 3.93]	.323
		Control	3.42	0.63	[3.19, 3.65]				Control	3.87	0.55	[3.67, 4.07]	
(VIA 23)	Humour	ASC	2.99	0.64	[2.76, 3.22]	<.001*	(VIA 4)	Love of Learning	ASC	3.48	0.77	[3.23, 3.72]	.172
		Control	3.79	0.64	[3.57, 4.02]				Control	3.72	0.62	[3.47, 3.96]	
(VIA 10)	Love	ASC	2.88	0.61	[2.63, 3.12]	<.001*	Strengths of Restraint		M	SD	95% CI	p	
		Control	3.69	0.76	[3.44, 3.93]		(VIA 7)	Persistence	ASC	3.08	0.83	[2.80, 3.36]	.097
(VIA 12)	Social Intelligence	ASC	2.42	0.53	[2.22, 2.62]	<.001*			Control	3.41	0.74	[3.14, 3.69]	
		Control	3.65	0.61	[3.45, 3.85]		(VIA 18)	Prudence	ASC	3.29	0.57	[3.11, 3.48]	.852
Interpersonal Strengths			M	SD	95% CI	p			Control	3.32	0.49	[3.13, 3.51]	
(VIA 11)	Kindness	ASC	3.05	0.69	[2.83, 3.27]	<.001*	(VIA 19)	Self-regulation	ASC	2.99	0.64	[2.76, 3.22]	.146
		Control	3.88	0.53	[3.66, 4.09]				Control	3.23	0.65	[2.30, 3.45]	
(VIA 13)	Teamwork	ASC	3.00	0.63	[2.79, 3.21]	<.001*	(VIA 5)	Perspective	ASC	3.01	0.62	[2.80, 3.22]	<.001*
		Control	3.66	0.56	[3.45, 3.87]				Control	3.60	0.56	[3.39, 3.81]	
(VIA 14)	Fairness	ASC	3.43	0.63	[3.23, 3.63]	.001*	(VIA 8)	Authenticity	ASC	3.64	0.49	[3.48, 3.80]	.188
		Control	3.90	0.49	[3.70, 4.10]				Control	3.79	0.43	[3.63, 3.95]	
(VIA 15)	Leadership	ASC	2.79	0.74	[2.56, 3.01]	<.001*	Theological Strengths		M	SD	95% CI	p	
		Control	3.62	0.52	[3.39, 3.84]		(VIA 24)	Spirituality	ASC	2.04	0.80	[1.73, 2.35]	.013
(VIA 16)	Forgiveness	ASC	2.81	0.67	[2.59, 3.03]	<.001*			Control	2.60	0.93	[2.29, 2.90]	
		Control	3.46	0.59	[3.24, 3.69]		(VIA 21)	Gratitude	ASC	2.90	0.62	[2.69, 3.10]	<.001*
(VIA 17)	Modesty	ASC	3.19	0.59	[2.99, 3.39]	.947			Control	3.55	0.54	[3.34, 3.76]	
		Control	3.20	0.53	[3.00, 3.40]		(VIA 20)	Appreciation of beauty	ASC	3.11	0.72	[2.88, 3.35]	.011
							Control		3.54	0.59	[3.31, 3.78]		

N = 32 in both groups. Benjamini and Hochberg (1995) corrected significance level $q < .03$

Bolded values with * indicate statistical significance. Confidence Intervals are bootstrapped.

Ipsative ranking and signature strengths

We assigned ipsative ranks to individual strengths scores, from 1 (highest) to 24 (lowest), resulting in a specific ranking order for each participant (see Table 4). Based on that ranking, we identified the five most highly ranked strengths for each individual (which are referred to as signature strengths) and calculated percentages for how often a certain strength belonged to the signature strengths in each group. *Open mindedness* (ASC: 63%, Rank 1; Controls: 50%, Rank 2), and *fairness* (ASC: 34%, Rank: 5; Controls: 50%, Rank: 2) were among the most common signature strengths in both groups. *Love of learning* (ASC: 53%, Rank: 3; Controls: 28%, Rank: 7.5), *authenticity* (ASC: 59%, Rank: 2; Controls: 22%, Rank: 11) and *creativity* (ASC: 47%, Rank: 4; Controls: 22%, Rank: 11) were within the most common signature strengths in the ASC group, but not in the control group. *Humour* (ASC: 13%, Rank: 15; Controls: 50%, Rank: 2), *kindness* (ASC: 22%, Rank: 11; Controls: 38%, Rank: 4) and *love* (ASC: 9%, Rank 18; Controls: 34%, Rank: 5) were among the most common signature strengths in the control group, but not in the ASC group.

To reveal group differences between these percentages, we conducted chi-square tests (see Littman-Ovadia & Lavy, 2012) for those strengths that were ranked within the top five for at least one of the groups (*open-mindedness, authenticity, love of learning, creativity, fairness, humour, kindness, love*). Accounting for multiple testing, corrected levels of significance were administered using the false discovery rate procedure developed by Benjamini and Hochberg (1995). A corrected level of significance of $q < .03$ was considered as significant. *Creativity* was significantly more often a signature strength in the ASC group ($\chi^2(1) = 5.74, p = .02$) than in the neurotypical group, while *love* ($\chi^2(1) = 5.85, p = .02$) and *humour* ($\chi^2(1) = 10.47, p < .01$) were significantly more often signature strengths in the neurotypical group. There were no significant differences between groups regarding the other strengths. For a complete display of this ranking, see Table 4.

Table 4. Ranking of Signature Strengths

ASC					Control				
VIA-IS Skala		Rank	N	%	VIA-IS Skala		Rank	N	%
VIA 3	<i>Open-Mindedness</i>	1	20	63	VIA 3	<i>Open-Mindedness</i>	2	16	50
VIA 8	Authenticity	2	19	59	VIA 14	<i>Fairness</i>	2	16	50
VIA 4	Love of Learning	3	17	53	VIA 23	<i>Humour</i>	2	16	50
VIA 1	Creativity	4	15	47	VIA 11	<i>Kindness</i>	4	12	38
VIA 14	<i>Fairness</i>	5	11	34	VIA 10	<i>Love</i>	5	11	34
VIA 18	Prudence	6	10	31	VIA 2	Curiosity	6	10	31
VIA 6	Bravery	8	9	28	VIA 4	Love of Learning	7.5	9	28
VIA 7	Persistence	8	9	28	VIA 13	Teamwork	7.5	9	28
VIA 17	Modesty	8	9	28	VIA 21	Gratitude	9	8	25
VIA 2	Curiosity	10	8	25	VIA 7	Persistence	11	7	22
VIA11	Kindness	11	7	22	VIA 8	Authenticity	11	7	22
VIA 5	Perspective	12	6	19	VIA 12	Social Intelligence	11	7	22
VIA 20	Appreciation of beauty	13.5	5	16	VIA 20	Appreciation of beauty	13.5	6	19
VIA 13	Teamwork	13.5	5	16	VIA 1	Creativity	13.5	6	19
VIA 23	Humour	15	4	13	VIA 22	Hope	15.5	5	16
VIA 9	Zest	18	3	9	VIA 5	Perspective	15.5	5	16
VIA 10	Love	18	3	9	VIA 6	Bravery	19	4	13
VIA 19	Self-regulation	18	3	9	VIA 15	Leadership	19	4	13
VIA 21	Gratitude	18	3	9	VIA 17	Modesty	19	4	13
VIA 22	Hope	18	3	9	VIA 18	Prudence	19	4	13
VIA 16	Forgiveness	21	2	6	VIA 19	Self-regulation	19	4	13
VIA 24	Spirituality	22	1	3	VIA 9	Zest	23	3	9
VIA 12	Social Intelligence	23.5	0	0	VIA 16	Forgiveness	23	3	9
VIA 15	Leadership	23.5	0	0	VIA 24	Spirituality	23	3	9

Only ASC*Only Control***Both groups**

Satisfaction with life and character strengths

Satisfaction with life was significantly lower in the ASC group ($M = 2.9$, $SD = 1.2$) than in the neurotypical group ($M = 4.5$, $SD = 1.4$), $t(62) = 4.76$, $p < .001$). In order to identify strengths that might be of particular importance for satisfaction with life in the two groups, Pearson correlations with the 24 character strengths of the VIA-IS and the SWLS were conducted. Accounting for multiple testing, corrected levels of significance were administered using the false discovery rate procedure developed by Benjamini and Hochberg (1995). A corrected level of significance of $q < .02$ was considered as significant. Descriptively, the two groups had the strongest associations between *hope* and *zest* with satisfaction with life, respectively. In addition, *kindness*, *social intelligence*, *teamwork* and *humour* were most strongly related to satisfaction with life for the ASC group, while for the control group *persistence*, *curiosity*, *perspective* and *humour* were most strongly correlated to satisfaction with life. For a complete display of correlations, see Table 5.

Table 5. Correlations between VIA-IS character strengths and SWLS

		ASC	<i>p</i>	Controls	<i>p</i>
VIA-22	Hope	.672* [.413, .857]	<.001	.787* [.622, .893]	<.001
VIA-9	Zest	.602* [.288, .807]	<.001	.727* [.450, .891]	<.001
VIA-11	Kindness	.491* [.195, .738]	.004	.235 [-.062, .529]	.196
VIA-23	Humour	.466* [.204, .677]	.007	.539* [.223, .776]	.001
VIA-12	Social Intelligence	.464* [.206, .687]	.008	.476* [.105, .741]	.006
VIA-13	Teamwork	.458* [.200, .649]	.008	.503* [.249, .719]	.003
VIA-16	Forgiveness	.389 [.072, .649]	.028	.429* [.133, .661]	.014
VIA-21	Gratitude	.367 [-.061, .761]	.039	.356* [.008, .637]	.045
VIA-20	Appreciation of beauty	.365 [-.040, .689]	.040	.087 [-.207, .344]	.636
VIA-6	Bravery	.363 [-.022, .600]	.041	.536* [.118, .778]	.002
VIA-15	Leadership	.343 [.039, .598]	.055	.406 [.044, .653]	.021
VIA-14	Fairness	.337 [-.029, .598]	.059	.300 [-.005, .560]	.095
VIA-7	Persistence	.336 [-.062, .672]	.060	.644* [.390, .814]	<.001
VIA-24	Spirituality	.330 [-.030, .637]	.066	.436* [.122, .683]	.013
VIA-2	Curiosity	.269 [-.124, .588]	.137	.634* [.353, .791]	<.001
VIA-19	Self-regulation	.224 [-.246, .626]	.217	.340 [-.056, .620]	.057
VIA-10	Love	.207 [-.152, .615]	.257	.519* [.118, .794]	.002
VIA-1	Creativity	.199 [-.077, .472]	.275	.319 [-.074, .608]	.075
VIA-5	Perspective	.188 [-.205, .509]	.303	.576* [.310, .761]	.001
VIA-18	Prudence	.175 [-.230, .502]	.339	.133 [-.351, .549]	.467
VIA-17	Modesty	.158 [-.240, .446]	.387	-.031 [-.405, .362]	.867
VIA-8	Authenticity	.142 [-.243, .521]	.437	.300 [-.109, .619]	.095
VIA-4	Love of learning	.125 [-.270, .456]	.494	.338 [-.146, .681]	.059
VIA-3	Open-mindedness	-.149 [-.479, .190]	.415	.130 [-.335, .475]	.478

N = 32 in both groups.

Benjamini and Hochberg (1995) corrected significance level $q < .02$

Bolded values with * indicate statistical significance

95% Confidence Intervals are reported in []

2.1.5 DISCUSSION

Individuals with ASC and controls were compared regarding their endorsement of character strengths. The ASC group scored mostly lower on those character strengths that can be classed as *interpersonal* (e.g. *teamwork*, *kindness*) and *emotional* (e.g. *social intelligence*, *love*) strengths. These results are consistent with the findings from Samson and Antonelli (2013) and the clinical picture of individuals on the autism spectrum being characterized by persistent deficits in social communication and social interaction across multiple contexts (DSM-5, American Psychiatric Association, 2013). In line with Samson and Antonelli's study, we found *open-mindedness* to be the highest character strength (with $M = 3.7$ which is comparable to the norm population reported by Ruch and colleagues (2010) in the validation study). However, unlike Samson and Antonelli (2013), we did not find individuals with ASC to score higher on *open-mindedness* than neurotypical individuals. Replicating Samson and Antonelli's (2013) findings, individuals with ASC did not differ from neurotypical controls on most *intellectual strengths* and *strengths of restraint*. In detail, individuals with ASC did not differ from neurotypical individuals regarding *creativity*, *open-mindedness*, *love of learning*, *persistence*, *prudence*, *self-regulation* or *authenticity*. This corroborates a study from Strunz and colleagues (2014), who assessed high-functioning individuals with ASC using the NEO personality inventory-revised (NEO-PI-R) and found them to be as intellectually curious, as dutiful and to strive as much for achievements as neurotypical controls. Interestingly, in a neurotypical sample, Harzer and Ruch (2014) found *persistence*, *prudence*, *authenticity*, *self-regulation* and *teamwork* to be associated with work performance across different occupations. *Persistence*, *self-regulation* and *love of learning* were (among others) associated with job dedication. That means that individuals with ASC endorse many character strengths that are important for successful employment to the same extent as neurotypical individuals. In light of the high unemployment rates in individuals with ASC (Howlin & Moss, 2012; Kirchner & Dziobek, 2014; Riedel, 2015; Taylor & Seltzer, 2011), we believe that knowledge about job-relevant strengths is of particular interest for potential employers, but also for individuals with ASC themselves, as knowing about one's strengths can help to put them into practice and lead to greater self-esteem.

Signature strengths

As a next step, we examined the *signature strengths* profiles in the two groups. *Signature strengths* are the top-ranked strengths within an individual's strength profile. For individuals with ASC, the most frequent *signature strengths* were *open-mindedness*, *creativity*, and *love of learning (intellectual strengths)*, next to *authenticity (strength of restraint)* and *fairness (interpersonal strength)*. In comparison, strengths which were most often in the *signature strengths* profile of neurotypical individuals were *open-mindedness (intellectual strength)*, *humour* and *love (emotional strengths)* as well as *fairness* and *kindness (interpersonal strengths)*.

Park and Peterson (2009) pointed out that focusing on *signature strengths* in individuals with a history of poor achievements is a promising strategy, as it can be applied at any level of ability and working with and on those strengths can help to build up rapport with professionals and confidence in oneself, and in a next step, motivation to work on one's less developed strengths. Furthermore, there is first evidence, that individuals who received feedback about their signature strengths and then used them in novel ways showed improved satisfaction with life and decreased symptomatology of depression (Seligman et al., 2005).

There are similarities and differences in the *signature strengths* profiles of the ASC and the neurotypical group. While the *signature strengths* profiles of individuals with ASC comprise mainly *strengths of restraint*, neurotypical individuals had mostly *emotional* and *interpersonal* strengths within their top-ranked strengths. While both groups had *open-mindedness* and *fairness* within their signature strengths profiles, individuals with ASC had *creativity* within their signature strengths profiles significantly more often and neurotypical individuals more often had *humour* and *love* within their top-ranked strengths.

Open-mindedness and *fairness* have been typically found to be among the highest endorsed strengths in neurotypical individuals (Park, Peterson, & Seligman, 2006; Ruch et al., 2010). Individuals, who score high on *open-mindedness* think things through, examine aspects from all sides, weigh the pros and cons carefully and do not jump to conclusions impulsively. The systemizing tendency in individuals with ASC, which was first described by Baron-Cohen (2003), might contribute to the endorsement of *open-mindedness* in individuals with ASC. Following the theory of systemizing, individuals with ASC seek to discover the "truth" by looking for lawful patterns and they are more likely to base their judgment on rules (e.g. weighing pros and cons) rather than on information which comes from empathizing (Baron-Cohen, 2009). *Fairness* consists of treating all people the same

according to principles of fairness and justice, and individuals who endorse the character strength *authenticity* speak the truth and present themselves in a genuine way. These latter two character strengths can also be facilitated by the trend to systemize. There are anecdotal reports that individuals with ASC adhere to social rules in a deterministic way (such as sharing things equally or telling the truth). More evidence towards strengths in *authenticity* and *fairness* in individuals with ASC comes from other studies. Izuma and colleagues (2011) found individuals with ASC to be less likely to adapt their behaviour in order to improve their social reputation than neurotypical controls and we found individuals with ASC to have fewer social stereotypes against minorities compared to a neurotypical control group (Kirchner, Schmitz, & Dziobek, 2012).

Another character strength belonging to the most frequent *signature strengths* in individuals with ASC – and significantly more often than in neurotypical controls – was *creativity*. Individuals who endorse *creativity* as a character strength consider themselves as original thinkers and like to come up with new and different ideas. Hans Asperger (1944) wrote that for success in science or art a dash of autism, including the ability to rethink a subject with originality, is essential and there are ongoing speculations about famous scientists and artists having been on the autism spectrum (e.g. James, 2003). Empirical evidence regarding creativity being a strength in individuals with ASC comes from a study from Liu and colleagues (2011), who assessed individuals with ASC with a creativity assessment packet and found them to score higher on originality and elaboration. In addition, we identified *creativity* as the second most common approach in pursuing one's special interest (after systemizing) in individuals with ASC (Kirchner & Dziobek, 2014).

The fifth character strength, which belonged to the most common signature strengths in individuals with ASC was *love of learning*, which comprises the eagerness to master new skills, topics and bodies of knowledge. Again, this finding is in line with empirical and anecdotal evidence. *Knowledge acquiring* was the third approach we identified with which individuals with ASC pursue their special interest (Kirchner & Dziobek, 2014); furthermore, individuals with ASC can acquire an astonishing body of knowledge in their special interests, often through self-guided studying (Asperger, 1944; Attwood, 2003; Caldwell-Harris & Jordan, 2014), which again might be facilitated by their cognitive style of systemizing (Baron-Cohen et al., 2009) and/or by their enhanced perceptual processing (Happé & Vital, 2009; Mottron et al., 2006).

Character strengths and satisfaction with life

As a third step, we examined levels of satisfaction with life and associations between character strengths and satisfaction with life. We found that individuals with ASC showed significantly lower levels of satisfaction with life than neurotypical individuals, which is in line with previous studies (Jennes-Coussens et al., 2006; Schmidt et al., 2015). Character strengths are meant to enable fulfilments in life; i.e., predict a variety of good life outcomes. For example, school achievement is consistently predicted by *love of learning, perseverance, zest, gratitude, hope, and perspective*. As regards satisfaction with life, all strengths correlated positively with *love, zest, curiosity, gratitude* and *hope* being the five consistently yielding the highest coefficients (Park et al., 2004; Peterson et al., 2007; Ruch et al., 2010). The correlational pattern differs for certain groups, therefore knowing which character strengths are associated with satisfaction with life for a certain group or individual can provide important information for interventions (Littman-Ovadia & Lavy, 2012), as there is evidence that fostering those strengths has a positive effect on satisfaction with life (Proyer et al., 2013). Surprisingly, Samson and Antonelli (2013) found that of the 24 character strengths, only *hope* was associated with satisfaction with life in individuals with ASC. In contrast to that – and more in line with previous research in neurotypical individuals – we found various character strengths to be associated with satisfaction with life in individuals with ASC. In detail, we found *hope, zest, kindness, humour, social intelligence* and *teamwork* (all *emotional* or *interpersonal strengths*) to have the highest positive associations with satisfaction with life in the ASC group. Interestingly, none of the *signature strengths* of the ASC group were associated with satisfaction with life. Associations between satisfaction with life and character strengths in our control group yielded significant moderate to high correlations for those character strengths which typically show highest associations with satisfaction with life (*love, zest, curiosity, gratitude* and *hope*), with *love* and *humor* also being signature strengths. However, we also found strong correlations between other character strengths and satisfaction with life which are similar to the autistic group (e.g. *humor, teamwork*).

It is remarkable that in individuals with ASC, *interpersonal* and *emotional strengths* in particular are related to satisfaction with life. One possible interpretation is that higher levels of *emotional* and *interpersonal character strengths* contribute to higher satisfaction with life in individuals with ASC, which would underline the importance of training social and emotional competencies in individuals with ASC. However, our cross-sectional research design does not allow for interpretation of causation. More evidence for the importance of

emotional and *interpersonal strengths* for individuals with ASC comes from a study from Mazurek (2014), who found loneliness to be associated with decreased levels of life satisfaction in individuals with ASC, while greater quantity and quality of friendships were associated with decreased loneliness among adults with ASC. In addition, in a previous study we found the ability to participate in society to be the only variable out of different areas of functioning to predict satisfaction with life (Schmidt et al., 2015)

Our results regarding associations of character strengths with satisfaction with life differ from those reported by Samson and Antonelli (2013). One reason might be differences in the characteristics of the ASC groups: for example, Samson and Antonelli pointed out that in their ASC group, the level of satisfaction with life was surprisingly high ($M = 4.16$, indicating average satisfaction with life). In comparison, the score for our ASC group was $M = 2.9$, indicating dissatisfaction (Diener, 2006). Also the sex ratio in Samson and Antonelli's ASC sample (14 male, 19 female) was different from that in our study (21 male, 11 female), with our group being closer to the estimated sex ratio for individuals with ASC (2-3:1 Lai et al., 2014). Gender-specific mechanisms which contribute to the relationship between character strengths and satisfaction with life in women and men (Brdar et al., 2011) might partly explain diverse findings between our work and Samson and Antonelli's study; however, this remains speculative, as our sample is too small to allow for separate correlation analysis.

In addition to the importance of certain character strengths for satisfaction with life, it is also fruitful to consider the fit between environment and tasks (e.g. at work) with the character strengths of an individual. For example, it has been shown in neurotypical individuals, that subjects who apply their signature strengths at work, report more positive experiences (Harzer & Ruch, 2012). Thus future studies should evaluate how exercising character strengths, and signature strengths in particular, can contribute to the improvement of outcomes (e.g. satisfaction with life, work satisfaction, etc.) in individuals with ASC.

The results of this study should be interpreted with the following limitations in mind: All collected data are self-reported data and groups might differ in their capacity for insight regarding the different psychological concepts. The size of our research sample was relatively small, which limits the generalization of our findings. As our study design is cross-sectional, we can only identify associations between character strengths and satisfaction with life: we cannot infer causation between variables. In this study we use purely self-report questionnaires, for future studies we recommend to also use a peer-rating form for the

character strengths (Ruch et al., 2010) in addition to the self-evaluation form. We believe that looking at character strengths in individuals with ASC can help us to gain a more comprehensive understanding of their personality. Specifically, it can help us to gain a more balanced view and help professionals, family members and individuals with ASC to focus on resources rather than deficits. Additionally, a better understanding regarding the associations between character strengths and life satisfaction can provide important information for interventions targeting the improvement of outcomes such as satisfaction with life in individuals with ASC.

2.2 STUDY 2: STEREOTYPES IN AUTISM REVISITED⁶

2.2.1 ABSTRACT

Autism involves core impairments in social cognition. Given that social learning underlies the acquisition of stereotypes, it was hypothesized that use of stereotypes would be reduced in autism. Contrary to this prediction, previous studies found the same use of stereotypes in autistic individuals as in controls. Measurement of stereotypes, however, can be biased by effects of social desirability, which previous studies did not account for. In the current study we therefore employed an implicit approach, using the Implicit Association Test (IAT), which assesses more automatic components of stereotypes in nineteen individuals with autism and nineteen controls. The data suggest that while both groups do show the use of stereotypes to some extent, autistic individuals have less stereotypical attitudes against the investigated minority.

⁶ This study has previously been published as:

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DOI Link: <http://dx.doi.org/10.1007/s10803-012-1460-9>

2.2.2 INTRODUCTION

Stereotypes are core elements in a person's social knowledge (Fazio & Olson, 2003) and they are considered as influencing the processing of social information in a substantial way. Once they are acquired, stereotypes can be both beneficial as well as maladaptive, depending on circumstances: As stereotypes are simplified conceptions of groups, they allow time-economic decision-making. However, stereotypes and prejudices can also be the source of many human conflicts. Hamilton & Krendl (2007) pointed out that there would be "one group of individuals who one might think to be immune to the influence of stereotypes", namely autistic individuals. Hallmarks of autism spectrum conditions (ASC) are impairments in social information processing (Volkmar, 2011). Autistic individuals have limited interest in social stimuli (Dawson, Meltzoff, Osterling, Rinaldi, & Brown, 1998), show reduced joint attention (Dawson et al., 2004), a lack of imitation (Rogers et al., 2003), and difficulties in understanding other people's intentions or taking the perspective of another person (Baron-Cohen, 2000). Those factors are, however, prerequisites for social learning, which is indeed impaired in autistic individuals (Bushwick, 2001). As social learning underlies the acquisition of stereotypes (Stroebe et al., 2011), we hypothesized that stereotypes will be reduced in autistic individuals.

There have been a growing number of studies in the past years investigating the use of stereotypes in autistic individuals. Surprisingly, those studies found that autistic individuals show the same use of stereotypes as typically developed controls, which was interpreted as a social resource and an islet of social ability (Da Fonseca et al., 2011; Hamilton & Krendl, 2007; Hirschfeld et al., 2007; White, Hill, Winston, & Frith, 2006). However, the measurement of stereotypes can be biased by various factors, most importantly by the participant's tendency to present him or herself in a socially desirable way, along with what one assumes is considered politically correct in the given situation (Franco & Maass, 1999). Previous studies focused on explicit measures to assess stereotypes in autism, such as asking the participants directly to make judgements on people based on group membership (Da Fonseca et al., 2011; Hirschfeld et al., 2007; White et al., 2006). We believe, however, that the effect of the social desirability bias might be reduced in autistic individuals, due to their impairments in theory of mind (e.g. Baron-Cohen, 2000). As perspective taking is one of the underlying processes of the social desirability bias (Watson & Morris, 1991), autistic individuals might be less likely to adjust their behaviour in a socially desired way compared to control participants. Hence, while controls might adjust their answering patterns in explicit measures of stereotypes towards a decreased level of stereotypes, autistic individuals

might not do so to the same extent. This could be an explanation for why previous studies did not find a difference in the use of stereotypes between controls and autistic individuals.

To overcome the influence of the social desirability bias, implicit measures were introduced into research of stereotypes and prejudices (Fazio & Olson, 2003). Implicit measures are used to assess more automatic components of stereotypes that are difficult to control or to manipulate. In the current study we therefore used an Implicit Association Test (IAT, Greenwald et al., 1998), which is the most frequently used implicit measure for automatic stereotypical attitudes, to compare autistic individuals and typically developed controls.

2.2.3 METHODS

Sample

Nineteen autistic participants (ASC; 8 female) and 19 controls (NT; 5 female) volunteered in the present study. Diagnoses were made according to DSM-IV-R criteria (American Psychiatric Association, 2000) and were confirmed with the German version of the ADI-R (Bölte & Poustka, 2001) in 14 participants with available parental informants. Their mean age was 31.0 years (range 19-45). They were matched to controls by gender ($\chi^2(1) = 1.05, p = .31$), age ($t[41] = 0.69, p = .49$), years of education ($t[38] = 0.38, p = .71$), and IQ ($t[36] = 0.90, p = .38$). For IQ measurement, the ‘Wortschatztest’ (German for “vocabulary test”) by Schmidt and Metzler (1992) was administered. All participants were native speakers of the German language.

Instruments

Implicit Association Test (IAT). We employed an IAT that has previously successfully been used to assess automatic stereotypes towards German and Turkish people (Klauer et al., 2010). The IAT is a computerized classification paradigm that involves two tasks, (i) a concept task, in which first names (e.g. Matthias, Mustafa) have to be classified as either *German* or *Turkish*, and (ii) an attribute task in which emotionally-valent stimuli (e.g. pleasure, disaster) have to be classified as either *positive* or *negative* (see Figure 1). The IAT score is computed on the basis of two phases in which both tasks are presented strictly alternating. Responses are always given by pressing one of two response keys, but the mapping changes between different IAT phases. In the present study, all participants started with a phase in which German names and positive words share one key (and Turkish names

and negative words the other one), in a second phase the response assignment was crossed. The IAT phase with faster and more accurate responses is usually called the ‘compatible IAT phase’, the other one the ‘incompatible’ one. The IAT effect reflects the performance difference between both phases and is computed on the basis of log-transformed latencies or errors (Greenwald, et al., 1998). The difference score was coded in a way so that high IAT scores indicate a preference for Germans or prejudice against Turkish people, respectively. The magnitude of the IAT effect is considered as reflecting the degree of using automatic stereotypes. However, it has been criticized that latency and accuracy scores can be biased in case of speed-accuracy trade-offs (Brendl, Markman, & Messner, 2001). In fact, it was shown that individual differences in response caution inflate latency-based IAT scores, thereby contributing to artificial correlations of unrelated IATs, while not being diagnostic of the participants attitude (Klauer, Voss, Schmitz, & Teige-Mocigemba, 2007).

Figure 1. Example of the Implicit Association Test.



This figure exemplifies the affordance in the IAT phase considered incompatible for most German participants. All stimuli are presented in the center of the screen. The labels in the lower corners remind the participant of pressing the left key for all German names and negative words, and to press the right key for all Turkish names and positive words.

Diffusion Model. An elegant way to circumvent this problem is to employ Ratcliff’s (Ratcliff & Rouder, 1998) diffusion model for response time data which simultaneously uses the information in latencies and errors, and which allows one to tease apart effects of response caution and task performance. Figure 2 illustrates the diffusion process underlying the diffusion model. The graph reads from left to right as a function of time. A response counter – originally in the middle (z) between two response boundaries (0 and a) – is postulated to start fluctuating as a function of incoming stimulus information (see hypothetical sample path). Processing of evidence of any of the response categories will

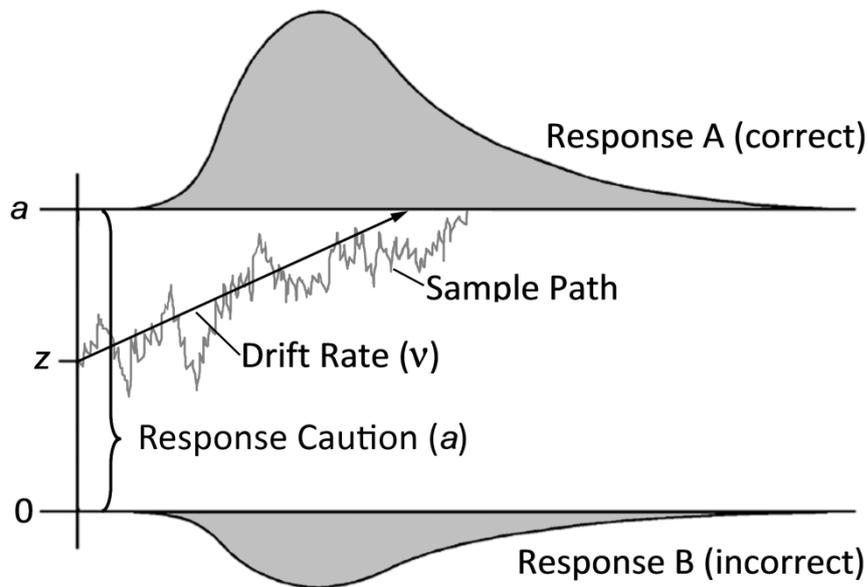
move the counter in the direction of its associated response boundary. Upon passing either of the two response boundaries, the according response is elicited.

The drift rate is the mean slope of the counter, which will depend on the perceived compatibility of the response mappings. For instance, participants who associate German names with positive valence will find it easy to classify stimuli in the IAT phase in which German names and positive stimuli share one response key: Both bits of stimulus information (its category as well as its associated valence) drive the decision process into the same direction. In contrast, in the IAT phase in which the mapping is crossed, responding will be particularly difficult, because both bits of information offer contradictory response evidence. Hence, strong associations between categories (or specific stimuli) and their evaluations will result in steep drift rates in the attitude-compatible IAT phase, whereas in low drift rates in the attitude-incompatible IAT phase. Irrespective of other factors that may contribute to the general level of the drift rates (e.g. efficiency of information processing; Voss, Rothermund, & Voss, 2004), the difference in drift rates between both IAT phases has been validated as measure of implicit stereotypical attitude (Klauer et al., 2007).

The response caution parameter corresponds with the distance between response boundaries (cf. Figure 2). The setting of response caution jointly determines response speed and the risk of committing an error: High response caution will increase the time it takes until the decision process reaches any of the response criteria, thereby increasing response times. However, high response caution will also reduce the risk that the noisy process of information accumulation (see sample path in Figure 2) will accidentally pass the wrong response boundary, thereby reducing error probability. A third parameter conventionally reported in analyses using the diffusion model is the non-decision parameter which captures processes outside the actual decision phase, such as elementary encoding of stimuli and motor processes (Ratcliff & Rouder, 1998; Voss et al., 2004) or task-set preparation (Schmitz & Voss, 2012). Neither the response caution parameter nor the non-decision parameter were found indicative of the participants' stereotypical attitudes (Klauer et al., 2007).

Hypothetical distributions for correct and erroneous responses are displayed outside their respective boundaries. The above mentioned parameters are theoretically predicted to account for the location and shape of the response time (RT) distributions (see Ratcliff & Rouder, 1998, for details). Parameters are estimated by minimizing the difference between empirical and model-implied RT distributions.

Figure 2. Diffusion Model.



This Figure depicts the diffusion process underlying the Diffusion Model. The graph reads from left to right as a function of time. A response counter – originally in the middle (z) between two response boundaries (0 and a) – is postulated to start fluctuating as a function of incoming stimulus information (see hypothetical sample path). Processing of evidence of any of the response categories will move the counter in the direction of its associated response boundary. Upon passing either of the two response boundaries, the according response is elicited. The drift rate is the mean slope of the counter. Hypothetical distributions for correct and erroneous responses are displayed outside their respective boundaries.

2.2.4 RESULTS

Conventional reaction time and error analyses. Across all IAT phases, autistic participants generally responded more slowly than control participants ($M = 822$ ms, $SD = 176$ ms, in the autistic group; $M = 663$ ms, $SD = 87$ ms, in the control group; $t[36] = 3.76$, $p < .01$). But autistic participants responded more accurately than controls, too (in terms of mean errors: $M = 3.3$ %, $SD = 1.9$ %, in the autistic group; $M = 6.3$ %, $SD = 4.7$ % in the control group; $t[36] = 2.53$, $p < .05$). The pattern is indicative of an overall difference in speed-accuracy settings between both groups. These group differences were even more pronounced in the block with attitude-incompatible response mapping, as detailed below.

Mean reaction times were $M = 720$ ms ($SD = 154$ ms) in the compatible IAT phase and $M = 939$ ms ($SD = 228$ ms) in the incompatible IAT phase for the autistic participants and $M = 603$ ms ($SD = 83$ ms, compatible IAT phase) and $M = 730$ ms ($SD = 98$ ms, incompatible IAT phase) for the control group, respectively. A mixed analysis of variance (ANOVA) with group as a between-participants factor and compatibility of the IAT phase as a within-participants factor revealed significant main effects of both factors ($F[1, 36] = 14.11, p < .01$, for the group factor, and $F[1, 36] = 126.70, p < .001$, for the compatibility factor). Autistic and control participants responded more slowly in the incompatible IAT phase than in the compatible IAT phase (both $p < .01$), revealing reliable IAT effects in both groups. Although latency-based IAT effects tended to be somewhat larger in the autistic group, this effect was not significant as indicated by the absence of an interaction effect of group and compatibility of the IAT phase ($F[1, 36] = 3.26, p = .08$).

In the error data, the pattern of effects was reversed. The autistic group committed $M = 2.5$ % ($SD = 0.6$ %) errors in the compatible IAT phase and $M = 4.1$ % ($SD = 0.5$ %) errors in the incompatible IAT phase, whereas the control group committed $M = 4.1$ % ($SD = 1.0$ %) and $M = 8.4$ % ($SD = 1.3$ %) errors, respectively. A mixed ANOVA with group and compatibility of the IAT phase as factors yielded a significant main effect of the group factor ($F[1, 36] = 6.39, p < .05$) and a significant effect of the compatibility factor ($F[1, 36] = 27.23, p < .001$). However, the latter was entirely driven by the compatibility effect in the control group ($t[36] = 2.99, p < .01$), indicating a reliable error-based IAT effect. In contrast, the error-based compatibility effect in the autistic group did not reach significance ($t[36] = 1.43, p = .16$), resulting in a significant interaction effect of group and compatibility ($F[1, 36] = 5.42, p < .05$).

The overall pattern in latency and error data suggests that there may be less of a bias in the autistic group. However, the apparent strong difference in speed-accuracy settings between the two groups compromises the interpretation of the findings and strongly calls for a more adequate way of data analysis that controls for the effects of speed-accuracy trade-offs.

Diffusion model analyses. We fitted individual diffusion models to the data of each participant to yield parameter estimates that were subsequently entered into mixed analyses of variance, as done in the previously reported conventional latency and error-based analyses.

Consider first the attitude-related drift-rate parameter. In the autistic group, drift rates were $M = 3.29$ ($SD = 1.12$) in the compatible IAT phase and $M = 2.36$ ($SD = 0.80$) in the incompatible IAT phase; in the control group they were $M = 4.12$ ($SD = 1.10$) and $M = 2.43$ ($SD = 0.56$), respectively. An ANOVA with group and compatibility as factors did not reveal a significant main effect of the group factor ($F[1, 36] = 3.20; p = .08$). But there was a main effect of the compatibility factor ($F[1, 36] = 66.68; p < .001$). Replicating Klauer and colleagues. (2007), drift rates were found to be lower in the incompatible IAT phase than in the compatible IAT phase. This was the case for the autistic as well as for the control group (both $p < .01$). However, a significant interaction effect of group and compatibility ($F[1, 36] = 5.67; p < .05$) revealed that the compatibility effect was of smaller magnitude in the autistic group. Compared with controls, drift rates were more comparable in the compatible and incompatible IAT phase in the autistic group, which means that Turkish and German stimuli were processed in a more comparable way, confirming a reduced bias in the autistic group.

In the autistic group, the response caution parameter was estimated to be $M = 1.3$ ($SD = 0.5$) in the compatible IAT phase and $M = 1.9$ ($SD = 0.4$) in the incompatible IAT phase; in the control group it was $M = 1.0$ ($SD = 0.4$) and $M = 1.3$ ($SD = 0.3$), respectively. An analogous analysis of variance indicated that response caution is generally increased in the incompatible IAT phase relative to the compatible IAT phase ($F[1, 36] = 29.58; p < .001$), corroborating theoretical predictions and previous findings for this parameter (Brendl et al., 2001; Klauer et al., 2007). In the present study, there was also a main effect of the group factor ($F[1, 36] = 13.63; p < .01$), indicating that the autistic group responded generally more cautious than controls. A significant interaction effect revealed that this group difference was more pronounced in the incompatible IAT phase ($F[1, 36] = 4.98; p < .05$) which is characterized by high levels of stimulus ambiguity and risk of response errors. This finding hints at group differences in response caution as a function of perceived ambiguity of the situation. However, given that this parameter was found non-informative for assessing stereotypical attitudes (Klauer et al., 2007), it will not be discussed in length in the present study.

In the autistic group, the non-decision time was estimated to be $M = .488$ ($SD = .075$) in the compatible IAT phase and $M = .555$ ($SD = .196$) in the incompatible IAT phase; it was $M = .468$ ($SD = .045$) and $M = .497$ ($SD = .070$) in the control group. An ANOVA revealed a main effect of the compatibility of the IAT phase ($F[1, 36] = 4.81; p < .05$; replicating

Klauer and colleagues (2007). There was neither a main effect of the group factor nor an interaction of group with compatibility (both $p > .18$).

2.2.5 DISCUSSION

In the current study an Implicit Association Test (IAT) was used as a measure of automatic stereotypical attitudes. We found both the autistic group and the control group to have lower drift rates in the incompatible block compared to the compatible block, hence both groups showed use of automatic stereotypes. However, the IAT-effect in the drift rate was significantly smaller in the autism group, hence indicating less use of automatic stereotypes in autistic participants. This result is at odds with the previous findings that autistic individuals use stereotypes to the same extent as control participants (Da Fonseca et al., 2011; Hirschfeld et al., 2007; White et al., 2006)..

We believe that these differences between our and previous studies could be explained by varying effects of a social desirability bias on the different measurements that were used. Previous studies applied more explicit measures, such as the Preschool Racial Attitudes Measure (Hirschfeld et al., 2007), where participants were asked to make attributions about characteristics (such as being friendly) or behavior (such as helping an old lady) of people based on group membership (for example indicated by colour of skin or gender). In another study, participants were requested to make judgements based on facial features, regarding, e.g., trustworthiness and social status (White et al., 2006). Da Fonseca and colleagues (Da Fonseca et al., 2011) asked participants explicitly to judge faces regarding friendliness, intelligence, and beauty. In contrast to those more explicit measures, we employed an Implicit Association Test (IAT) in the current study. As a computerized paradigm, which requires fast classifications of presented stimuli, the IAT captures more automatic components of stereotypical attitudes that are more difficult to manipulate. Hence, control participant might have been less capable of adjusting their answer patterns in a socially desirable way in the present study, resulting in the observed group differences. Given that control participants are more likely than autistic participants to conform to social norms, measures used in previous studies might have allowed control participants more easily to adjust their responses, thereby resulting in similar usage of stereotypes in the control and autistic groups.

Previous findings on stereotypes in autism have been used to inform the discussion on two possibly separable systems that govern person perception. Based on findings in children with autism and typically developed control children, Hirschfeld (1995) proposed two separate cognitive modules for making assumptions about another person: naïve sociology and naïve psychology. Naïve sociology is used to make sense of others' behavior on the basis of mere social group membership, whereas naïve psychology (theory of mind) considers psychological states in the other person. Only the latter was found to be impaired in the sample of autistic children, whereas naïve sociology was comparable across groups (Hirschfeld et al., 2007). In the present study with adults on the autism spectrum, we found stereotypical attitudes in individuals with autism and controls, but the use of automatic associations between group membership and valence (naïve sociology) was reduced in autism compared to controls. That being said, the present data neither allow any inference about naïve psychology nor on the suggested separability of both systems, given that both systems could be affected independently in autistic individuals.

In sum, the results of our study indicate less use of automatic stereotypes in autistic individuals. While we believe that introducing the IAT as an implicit measure helped excluding effects of social desirability, we see complementary value in explicit tasks. We thus believe that in future prospective studies, it will be important to assess stereotypes in autism with implicit and explicit measures as well as to assess the social desirability bias more explicitly. Generally, we consider autistic individuals' reduced rather than "intact" stereotyping a strength, the exact mechanisms of which are in need of further exploration.

3 PART II. TOWARDS EMPLOYMENT

3.1 STUDY 3: TOWARD THE SUCCESSFUL EMPLOYMENT OF ADULTS WITH AUTISM: A FIRST ANALYSIS OF SPECIAL INTERESTS AND FACTORS DEEMED IMPORTANT FOR VOCATIONAL PERFORMANCE⁷

3.1.1 ABSTRACT

Background: Adults with autism spectrum disorder (ASD) in the normal IQ range are disproportionately affected by unemployment.

Objective: To assess special interests that could bear potential for employment and factors deemed relevant for work performance in adults with ASD.

Method: A newly compiled self-report online questionnaire was administered in high-functioning adults with ASD, assessing special interests as well as factors that interfere with and facilitate work performance, respectively.

Results: Participants reported that they spent an average of 26 hours per week on their special interest and the average level of proficiency was rated as very good. Although special interests were reported to lie as often in social sciences and creative fields as in natural sciences and technology/engineering, the work style approach taken within those fields was characterized most often by systemizing rather than by a creative or knowledge-acquiring pursuit. Social interaction problems with coworkers and superiors as well as sensory issues were most often rated as interfering with work performance. Furthermore, mental underload was rated as an important factor interfering with work performance, while excessive demands were not. Among the factors most often reported to facilitate work performance were employers and colleagues' awareness about the individual's autism diagnosis.

⁷ This study has previously been published as:

Kirchner, J. C., & Dziobek, I. (2014). *Toward the Successful Employment of Adults with Autism: A First Analysis of Special Interests and Factors Deemed Important for Vocational Performance.* *Scandinavian Journal of Child and Adolescent Psychiatry and Psychology, 2(2), 77–85*

Conclusion: Our data suggest that special interests in ASD might bear important potential for employment. Given a focus on systemizing in this population, recent efforts to create job opportunities in the information technology sector specifically for high-functioning individuals with ASD are a promising start, which should, however, be expanded into other fields.

3.1.2 INTRODUCTION

Autism was first described in the 1940s by Leo Kanner (1943). The condition is characterized by early impairments in social interaction and communication, and by a restricted repertoire of activities and interests (American Psychiatric Association, 2000). Although it was originally assumed that autism was a rare disorder, with approximately 2-4 children per 10,000 affected (Wing & Potter, 2002), recent studies have reported prevalence rates of approximately 1% for all autism spectrum disorders (ASDs) (Baird et al., 2006; Brugha et al., 2011). Since Kanner's first description, enormous progress has been made in the area of autism research, but only in recent decades has there been a shift in focus from children with ASD to adults with ASD. Studies of outcomes in adulthood have shown that symptom severity often decreases with age (Seltzer, Shattuck, Abbeduto, & Greenberg, 2004); however, individuals with ASD seem to remain dependent on their families after their transition to adulthood (Howlin, Goode, Hutton, & Rutter, 2004; Levy & Perry, 2011) and their employment outcomes are poor (Hendricks & Wehman, 2009; Howlin et al., 2004; Shattuck et al., 2012). Shattuck and colleagues (2012) analyzed data from the National Longitudinal Transition Study 2, wave 4, a nationally representative survey of young adults who had received special education services during high school. Individuals with ASD had the lowest rates of ever having been employed in the first six years after high school (55.1%) as compared with individuals with other disabilities (i.e., speech/language impairment, learning disabilities, and mental retardation). Roux and colleagues (2013) found comparable results when analyzing data from wave 5 of this same study. Approximately 50 % of individuals with ASD between the ages of 21 and 25 years had the lowest rate of currently or ever having a paid job after leaving high school as compared with individuals with emotional disturbances, learning disabilities, and speech/language impairments. Furthermore, average wages and variability of jobs were lower in the ASD group than in the comparison groups. At the time of the study, approximately one third of the participants were currently employed. Howlin and colleagues (2004) followed up with a cohort of individuals who were diagnosed with autism in childhood and reported that only nine out of 68 individuals (age range, 21-48 years) were competitively employed at the time of the follow-up study, most of the others were working in sheltered work environments. Studies of supported employment programs and vocational rehabilitation services are still limited and are often of poor research quality (Nicholas, Attridge, Zwaigenbaum, & Clarke, 2014). Burgess and Cimera (2014) found that approximately one third of participants with ASDs who participated in a vocational rehabilitation service were employed; however, rates varied

between 25% and 50% across the United States. Another study by Howlin and colleagues (2005) examined the outcomes of a supported employment service (NAS Prospects) for adults with ASD and intelligence quotients of at least 60 and found that, after eight years, approximately two thirds of the participants were employed, with most of their contracts being permanent. Mawhood and Howlin (1999) conducted a quasi-experimental study that compared employment outcomes between an experimental group of high-functioning adults with ASD (n = 30) who received support with job finding, work preparation, and communication with their employers with those of a control group of high-functioning adults with ASD (n = 20) who did not receive any support. After two years, the experimental group showed significantly higher rates of employment (63%) as compared with the control group (25%).

Evidently, employment outcome varied considerably in these revised studies; however, results are difficult to compare due to the different elements of support offered, the duration of the studies, and the functioning levels of the participants. It has been suggested that especially high-functioning individuals with ASD may be disadvantaged in terms of access to the support they need to find employment. Taylor and Seltzer (2012) concluded that youths with ASD “in the mid-level of functioning — not severe enough to receive adult day services but too severe to function independently[...] — are ‘falling through the cracks’ during the transition to adulthood.”

During the last decade, there have been new efforts to create job opportunities for high-functioning individuals with ASD by start-up companies in the information technology sector, such as Specialisterne (e.g. Denmark, Iceland), Passwerk (Belgium), and Aspiritech (United States), most of which train their employees as software testers and offer job coaching and other individual support. Software testing is believed to be a task which autistic individuals perform well as a result of a working style characterized by attention to detail (Mottron et al., 2006), precision, an affinity for repetitive tasks (Gonzalez et al., 2013) and a general interest in technology (Baron-Cohen et al., 1998). This approach has been successful for the creation of jobs for autistic individuals, and there are similar start-up companies in numerous other countries (e.g. Germany, Japan, Switzerland). However, the number of jobs offered by these companies is limited, and they seem to match the strengths of only a subgroup of adults with ASD.

An appropriate job-match based on interests and strengths while at the same time considering weaknesses and offering long-term on-the-job-support seems to be the key for

successful employment (Hendricks, 2010; Keel, Mesibov, & Woods, 1997; Vogeley, Kirchner, Gawronski, Tebartz van Elst, & Dziobek, 2013). Migliore and colleagues (2012) found the probability of leaving a vocational rehabilitation program with employment to be four times greater for those who received job placement services than for those who did not. Hence, job placement is the strongest predictor of successful employment. That being said, little is known about the typical strengths and interests of individuals with ASD.

Surprisingly, the common presence of special interests in high-functioning adults with ASD, which could guide the search for employment strategies, has been mostly disregarded by the scientific community. Special interests have been estimated to exist in 90% of individuals with Asperger syndrome (Attwood, 2003), and Asperger himself (1944) claimed in his first descriptions that special interests can lead individuals with the syndrome to outstanding achievements in their chosen areas. To date, only a few studies have addressed special interests in individuals with ASD, and these have been limited to children and teenagers (Baron-Cohen; Wheelwright, 1999; Klin et al., 2007; South, Ozonoff, & McMahon, 2005; Winter-Messiers, 2007). Standardized instruments to assess special interests and their potential for employment in individuals with ASD are thus currently lacking.

The main goal of this exploratory study was to assess for the first time the areas of special interest for adults with ASD. In addition, we sought to identify more generally factors that are important for the successful employment of individuals with ASD.

3.1.3 METHODS

Survey Development

To assess information about employment from individuals with ASD for this exploratory study, a self-constructed questionnaire was used. The survey consisted of three parts: 1) background information and evaluation of employment situation; 2) the individuals' special interests; and 3) factors interfering with and facilitating job performance. (The items of the questionnaire can be found in Table 6.) There was no forced answering format (apart from the diagnostic items, which had to be filled out): i.e., participants were allowed to skip questions. Throughout the result section, we indicate how many participants answered each item, and results reported refer to that N accordingly. The questionnaire was developed in cooperation with a start-up company seeking to develop jobs for individuals with ASD and

a focus group of adults with ASD to ensure accessibility, respect, inclusion, and relevance of items.

Table 6: Questionnaire assessing special interests and factors which facilitate and interfere with work performance in individuals with ASD

Part I:

1) Do you consider yourself to be on the autism spectrum?

Yes/No

2) Do you have a clinical diagnosis of autism? Please indicate which one.

No /Yes, Asperger Syndrome/ Yes, Kanner-Autism/Yes, Atypical Autism/ Other, please specify/ I'd rather not say

3) Please indicate your highest level of education

List of German levels of education provided

4) Which of these options best describes your current situation?

I am a freelancer/ I am employed/ I am employed in a sheltered workplace/ I am doing vocational training/ I am doing vocational training in a sheltered workshop/ I am studying/ I am doing an internship / I am unemployed / I receive disability benefits

5) How satisfied are you with your current work situation? 1 (not satisfied) – 5 (very satisfied)

6) I believe that so far I have been able to use my vocational potential according to my skills.

1 (not true) – 5 (very true)

7) I believe that I possess skills which are relevant for employment. 1 (not true) – 5 (very true)

Part II:

Many individuals on the autism spectrum possess strongly pronounced interests, so-called special interests. In the following, we want to ask you to describe your special interest. Please choose the one which, in your opinion, would be most fitting for vocational use.

1) Please describe your special interest (e.g. programming websites, rebuilding antique guitars, filing historical street names). Open question format

2) Please indicate your level of knowledge of your special interest.

1 (Basic knowledge) – 5 (Excellent knowledge)

3) In a typical week, how many hours do you spend on your special interest?

4) Please label your special interest with one of the following categories which best matches it. (List of categories: see table)

Part III:

1) Please indicate which factors you perceive as interfering with your work (or in school) in the past? (List of factors: see figure 3)

2) Which factors would you consider as facilitating an ideal working environment?

(List of factors: see figure 4)

Part 1: Assessment of autism diagnosis and background information

Autism diagnosis was assessed with the use of a two-step procedure. Participants were first asked more broadly if they were on the autism spectrum. Next, participants were asked if they had an official clinical ASD diagnosis and, if so, to indicate which one. Only those participants who reported that they had an official clinical diagnosis of ASD were included in the study. Additional background information (e.g. education, current job situation, satisfaction with job situation) was also obtained.

Part 2: Special interests

Special interests were assessed using a two-step procedure. First, participants were asked to describe their special interest in an open answer format. The information provided was subject to an analysis of the main approach by which a special interest was pursued (e.g. programming, categorizing). Second, participants were asked to choose from a list the field of their special interest (e.g. mathematics, sociology). Although a comprehensive choice of fields was provided, participants could add additional fields if none of those provided matched their special interest.

Approach taken towards special interest. Thirty-one participants were included in the analysis, because only their answers provided enough detail for categorization according to the approach with which their special interest was pursued. In accordance with the principles of qualitative content analysis (Mayring, 2007), as a first step, categories were built inductively on the basis of the content of the provided answers. After that, anchor examples were collected, and coding rules were defined to specify the assignment of the different answers to the categories (see Table 7). In the next step, participants' answers (e.g. "searching for errors in software code"; "collecting information about autism diagnosis and diagnostic system") were assigned to the four categories by two independent raters. The Cohen's Kappa value for the assessment of interrater agreement was .94.

Table 7. Approaches

The **creativity approach** consists of all creative activities, such as making music, painting, and designing. The activity itself has to be creative, but this criterion is not met by simply being in a creative field.

Example: Playing an instrument, designing objects

The **systemizing approach** contains all activities that involve analyzing, constructing, or controlling a system. A system is defined as something that follows repeated, lawful patterns. The focus can be on small parts of the system, such as numbers, or the overall purpose of the system, such as programming software.

Example: Categorizing photographs, analyzing mathematical problems

The **knowledge approach** comprises those activities that are best described as accumulating knowledge about certain subjects.

Example: Acquiring information about plants, performing Internet research regarding historical events

Other should be assigned only if the approach of the special interest does not match with any of the categories above

Field of special interest. For analysis purposes, fields were grouped into superordinate interest themes (see also Winter-Messiers, 2007): human and social sciences, natural sciences and technology/engineering, and creative fields. See Table 8 for a list of the fields and their correspondence with the special interest themes.

Table 8. Superordinate interest themes and fields

<p>Human and Social Sciences <i>anthropology, education, ethnology, history, law, philosophy, politics, psychology, sociology, economics</i></p> <p>Natural Sciences & Technology/Engineering <i>biology, biochemistry, geology, agriculture, mathematics, physics, engineering, informatics</i></p> <p>Creative Fields <i>architecture, photography, graphic design, product design, fine arts, music</i></p>
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Time spent on special interests and skills. Participants were asked to indicate how much time they spent on their special interests in a typical week and to evaluate their skill level with regard to their special interests.

Part 3: Factors interfering with and facilitating job performance

A list of factors that potentially facilitate job performance and of those that may interfere with it was developed. The authors generated items based on a literature review (e.g. Hendricks, 2010; Hurlbutt & Chalmers, 2004) and on personal conversations with adults with ASD. A focus group of adults with ASD then provided feedback on the items and added items that were deemed relevant. Study participants were asked to select from this list the factors that had interfered with their job performance in the past and the factors that they deemed important for facilitating job performance in general.

Data Collection

The online survey was distributed through mailing lists and postings on bulletin boards for the autism community, and handouts were displayed in outpatient clinics. Participants received no incentive to participate. All surveys were completed anonymously. All parts of the study were conducted according to the declaration of Helsinki, and all subjects provided written informed consent.

3.1.4 RESULTS

Part I: Autism diagnosis and background information

The survey was completed by 108 adults. Those participants with an official diagnosis ($N = 76$), which was of Asperger Syndrome in all cases, were included in the analysis. For demographic data see Table 9.

Table 9. Demographics

	N	%
Gender ($N = 76$)		
Male	33	43.4
Female	43	56.6
Age ($N = 76$), Values are given in mean \pm SD	36.1 \pm 11.1	Range (19-60)
Education ($N = 67$)		
No school degree	2	2.7
Basic school degree (~ 9 years)	14	21
Vocational degree	12	18
Superior school education (~ A-levels)	17	25.3
University degree	22	32.8
Current job situation ($N = 64$)		
Employed	21	32.8
Self-employed	8	12.5
Currently studying	3	4.7
Disability benefits	3	4.7
Sheltered Work	2	3.1
Internship or vocational training	4	6.3
Unemployed	23	35.9

With regard to their current job situation ($N = 64$), 33% of participants reported that they were employed, 13% said that they were self-employed, and 36% reported that they were unemployed. Participants who were currently employed and those who were working freelance, respectively, indicated their satisfaction levels with their current employment situations to be more or less satisfying ($N = 31$, $M = 3.01$; $SD = 1.15$). On average, participants indicated that they had not or had only slightly been able to use their vocational potential in the past, with unemployed participants scoring significantly lower ($N = 23$, $M = 1.74$, $SD = 1.1$) than participants with jobs ($N = 31$, $M = 2.7$; $SD = 1.3$, $t(52) = 2.76$, $p < .01$). Unemployed individuals ($N = 23$, $M = 4.3$; $SD = .93$) scored as high as employed individuals ($N = 31$, $M = 4.26$; $SD = 1.03$, $t(52) = -.17$, $p = .87$) when asked to indicate whether they had relevant skills for the job market.

Part 2: Special interests

Approach taken towards special interest. The distribution of the categories was: 55% for the systemizing approach, 28% for the creativity approach, 14% for the knowledge approach, 3% for other approaches. Two items on which the raters did not agree were excluded.

Field of special interest. Of the 54 participants who indicated their special interests, 38% reported a special interest in natural sciences or technology/engineering, 34% had a special interest in human and social sciences, and 28% had a special interest in creative fields.

Table 10. Approach and field of special interest

Approach (N=31)	N	%	Field (N=54)	N	%
Systemizing	17	55	Natural Sciences and Technology / Engineering	21	38
Creativity	9	28	Human and Social Sciences	18	34
Knowledge	4	14	Creative	15	28
Other	1	3			

Time spent on special interests and skills. Participants (N = 51) reported that they spent an average of 26.2 hours per week ($SD = 16.3$) on their special interest. There was no significant difference between participants with or without jobs. Participants rated their average levels of skill regarding their special interests as very good ($M = 4.2$; $SD = 0.91$).

Part 3: Factors interfering with and facilitating job performance

Social factors such as problems with colleagues (76%) and superiors (74%) as well as sensory issues involving smell (60%) and background noise (64%) were most often rated as interfering with job performance. With respect to intellectual challenge, mental underload was rated by two thirds of the participants (70%) as an interfering factor, whereas excessive demands were only indicated by a minority of participants (23%). Among the factors most frequently rated as facilitating job performance were employers' (78%) and colleagues' (66%) awareness of the individual's autism diagnosis, quiet surroundings (76%), and an undisturbed working space (74%). Complete results are displayed in Figure 3 and 4.

Figure 3. Factors interfering with work performance

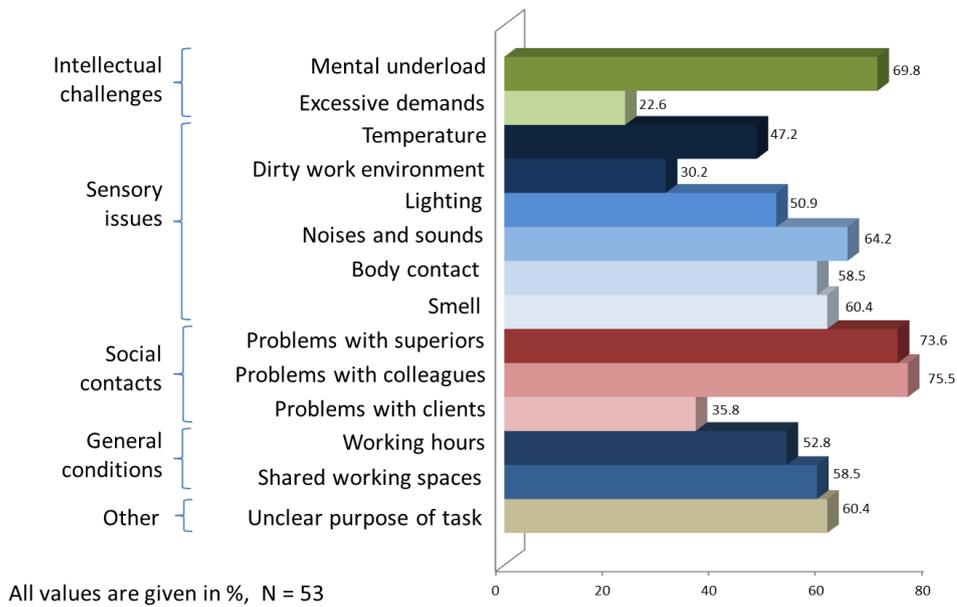
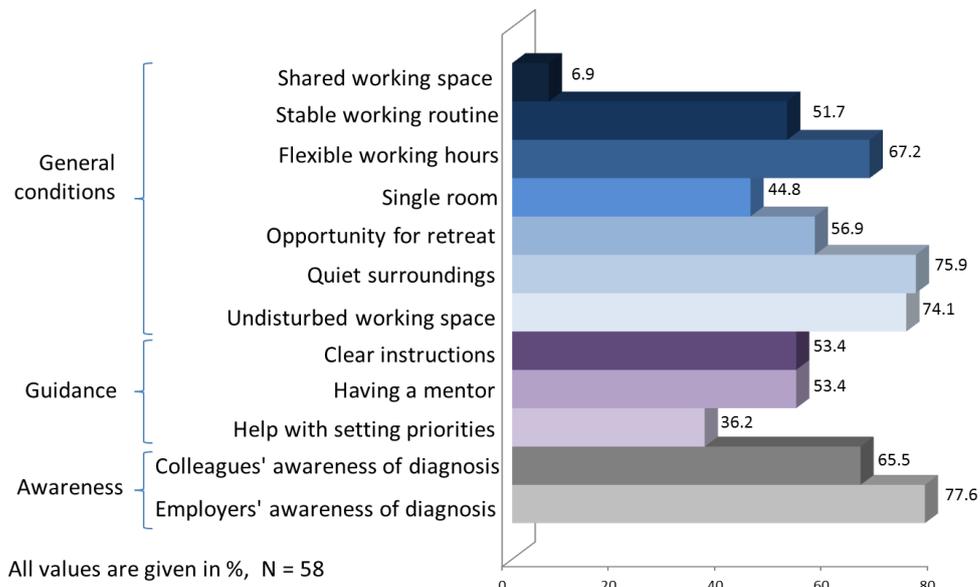


Figure 4. Factors facilitating work performance



3.1.5 DISCUSSION

We found that, despite high levels of education, more than one third of the participants with ASD in this study were unemployed. This number is well above the current general unemployment rate in Germany of 6.6% (Arbeitsagentur, 2012) but is in line with other studies that have reported high unemployment rates in individuals with ASD (Eaves & Ho, 2008; Howlin et al., 2004; Lin et al., 2012; Roux et al., 2013; Shattuck, Narendorf, et al., 2012). We carefully suggest that, despite predominantly high levels of education, individuals with ASD seem not to fulfill their full potential. Given that unemployment is associated with emotional-behavioral issues and health problems (Taylor & Hodapp, 2012) and that it has a negative impact on life satisfaction (Lucas, Clark, Georgellis, & Diener, 2004), this is alarming. Moreover, several researchers have pointed out the high cost to society that arises from the high number of unemployed individuals with ASD (Cimera & Cowan, 2009; Ganz, 2007).

Special Interests. This article is the first to assess special interests with the use of a two-step procedure that focuses on both the approach and the field of interest. Although an effort is made to relate our results to previous research, this is somewhat hindered by the different approaches taken to examine interests among individuals with ASD by prior studies (Baron-Cohen & Wheelwright, 1999; South et al., 2005; Winter-Messiers, 2007) and the fact that study participants were children and teenagers rather than adults. Furthermore, concepts and associated terminology vary across studies, with some focusing on “obsessions” (Baron-Cohen & Wheelwright, 1999), others on “circumscribed interests” (Klin et al., 2007), and still others on “repetitive behaviors” (South et al., 2005).

Special interests in the fields of *natural sciences and technology/engineering* were most commonly reported (38%), but interests in the *human and social sciences* (34%) and in *creative* fields (28%) were almost as common. This seems surprising given that autism has traditionally been mainly associated with the natural sciences. That being said, our data involving the different approaches with which special interests were pursued are able to shed some further light on this unexpected finding. In fact, we found *systemizing* to be the most common approach when pursuing special interests (55%), including in the social sciences and creative fields. This was followed by the *creative* approach (28%), and the *collecting knowledge* approach (14%). This is in line with other studies, which found high rates of special interests that were based on systemizing skills (Klin et al., 2007; South et al., 2005).

Moreover, systemizing has been described by Baron-Cohen (2009) as a common trait among individuals with ASD.

Only limited research exists regarding creative interests pursued by individuals with ASD. Some authors have reported music and art-related activities in their studies of special interests among children and adolescents with ASD (Baron-Cohen & Wheelwright, 1999; Winter-Messiers, 2007). Although *collection of knowledge* was the least common approach taken to pursue a special interest in our sample, other studies (Klin et al., 2007; South et al., 2005; Spiker, Lin, Van Dyke, & Wood, 2012) reported high levels of learning, reading, and memorizing facts to be associated with the special interests assessed in their participants.

Participants in our study reported that they spend a remarkable amount of time – 26 hours per week, on average – pursuing their special interests. Furthermore, they evaluated their own skills with regard to their special interests as being very good. Both of these factors are important indicators that it would be of value to consider special interests when developing employment strategies. Interestingly, unemployed participants evaluated themselves as possessing relevant skills for the job market to the same degree as employed participants did, which indicates that unemployed adults with ASD also bear potential for employment.

We consider the jobs that have recently been created in the information technology sector as an important first step toward more employment for individuals with ASD. Software testing evidently meets the strengths of individuals with ASD whose special interests are characterized by a systemizing approach and that lie in the field of technology/engineering. However, individuals who have interests in technology/engineering but who like to engage in a creative manner would be likely to perform better at software development rather than software testing, whereas an individual who approaches his or her interest in technology/engineering through collecting knowledge may enjoy working as an author of computer handbooks. This example indicates the importance of assessing the approach to and the field of special interests independently to inform employment strategies. Nye and colleagues (2012) found interests to predict vocational performance in neurotypical individuals, thereby underlining the importance of the match between a person's interest and his or her vocational setting. Although this finding awaits replication in individuals with ASD, we predict associations to be equally high or stronger in these individuals, because pronounced interests are more prevalent among those with ASD than in neurotypical individuals. However, the success of a job placement strategy is also determined by the

characteristics of the corresponding job market. Specialists in professions in the fields of technology/engineering and natural sciences are more sought after and may be offered better conditions than those in the fields of human and social sciences or the creative field. Jobs in the latter fields are usually rarer and hence more competitive. They are often characterized by short-term contracts or freelance employment.

Interfering and facilitating factors. Among the factors rated most often as interfering with work performance, participants reported a lack of cognitive challenge; excessive work demands were reported much less. Together with the often-reported social problems at work (Hurlbutt & Chalmers, 2004), the dilemma of many individuals with ASD becomes evident: although they are often proficient with respect to work-related demands, social problems may impede their ability to get or to keep jobs (Hurlbutt & Chalmers, 2004). Consequently, high functioning individuals with ASD often work in lower-level job positions (Levy & Perry, 2011). However, even in those positions, the social demands may still be overly challenging, whereas the lack of cognitive challenge adds to dissatisfaction with the employment situation.

Another important finding of the current study is that many participants report perceptual problems as interfering with work performance. These include irritations and negative reactions in response to body contact, noise, specific sounds, temperature, and lighting. The new DSM-5 criteria allow for sensory abnormalities by including hyper-reactivity to sensory input in the diagnostic criteria for ASD (American Psychiatric Association, 2012). Employers should therefore carefully assess the sensory issues of individuals with ASD and adjust the work space accordingly. Instruments for the assessment of sensory issues, such as the Adolescent Adult Sensory Profile (Brown & Dunn, 2002), can serve as inspiration for the design of checklists. Alternatively, sensory issues are also among the factors deemed important for facilitating work performance, because many participants indicate quiet surroundings and an undisturbed working space to be desirable. Another crucial factor that is deemed important for facilitating work performance is employers' and colleagues' awareness of the employee's autism diagnosis. This may partly explain the success of companies in the technology sector that employ individuals with ASD, which deal with the diagnosis of their employees openly.

Limitations Our study has several strengths, but it also has limitations. This research is the first to assess special interests in adults with ASD and to discuss their potential as part of employment strategies. However, the size of our research sample was relatively small,

which limits the generalization of the findings. In future studies we plan to collect data from more participants. In addition, the online procedure might have influenced the sample composition (i.e., only those individuals with ASD who have access to the internet and who are especially interested in work opportunities might have taken part in the study). The results we obtained are based on variable sample sizes, and we did not include a comparative group in our study. However, we believe that our approach was warranted given the exploratory nature of our study and given that no research to date has assessed this type of employment-related information. Future studies should compare the interests and needs of individuals with ASD that are relevant to employment with those of neurotypical individuals and other clinical groups.

3.1.6 GENERAL CONCLUSIONS

The special interests of individuals with ASD are pursued intensively and lie in a wide range of fields. Participants estimate their competencies in their fields of interest to be good as well as suitable for employment. Thus, our data suggest that special interests among individuals with ASD may be valuable sources to rely on when developing employment strategies for autistic individuals. Social interaction problems and sensory issues were most often rated as interfering with work performance, whereas the employers' and colleagues' awareness about the autism diagnosis was most often reported to facilitate work performance.

Given the German Code of Social Law, which postulates equal rights to employment opportunities for individuals with disabilities, there is a great need for more research efforts to target employment strategies for individuals with ASD.

3.2 STUDY 4: TOWARD THE DEVELOPMENT OF A SUPPORTED EMPLOYMENT PROGRAM FOR INDIVIDUALS WITH HIGH-FUNCTIONING AUTISM IN GERMANY⁸

3.2.1 ABSTRACT

Human-human-interactions are of central relevance for the success in professional and occupational environments, which also substantially influences quality of life. This is especially true in the case of individuals with high-functioning autism (HFA), who experience deficits in social cognition that often lead to social exclusion and unemployment. Despite good education and high motivation, individuals with HFA do not reach employment rates that are substantially higher than 50%. This is an alarmingly high rate of unemployment considering that the United Nations have recently emphasized the inclusion of handicapped persons as a mandatory human right. To date, the specific needs of autistic persons with respect to their working environment are largely unexplored. It remains moreover an open question how support systems and activities, including newly developed communication devices for professional environments of individuals with HFA, should look like. The German health care and social care systems are not adequately prepared for the proper support of this population. This leads us to suggest that supported employment programs (SEP) should be developed for adults with HFA that specifically address their needs and requirements. Such programs should comprise i) the adequate assessment of HFA, including a neuropsychological profile and an individual matching of persons' preferences with requirements of the working place, ii) on-the-job coaching activities that include systematic communication and interaction training, and iii) instruction of non-autistic peers, including colleagues and supervisors, about weaknesses and strengths of HFA.

⁸ This study has previously been published as:

Vogele, K., **Kirchner, J. C.**, Gawronski, A., Tebartz van Elst, L., & Dziobek, I. (2013). *Toward the development of a supported employment program for individuals with high-functioning autism in Germany*. European Archives of Psychiatry and Clinical Neuroscience, 263 Supplement, S197–203, doi: 10.1007/s00406-013-0455-7
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3.2.2 INTRODUCTION

The capacity to process socially relevant information, i.e., social cognition, is an essential component of professional environments, which force jobholders to cooperate with colleagues and clients and to coordinate their own activities with those of others. Autism affects the capacity to interact and communicate with others in a fundamental way, as especially the intuitive, fast, and prereflexive components of communication are lacking (Kuzmanovic, Schilbach, Lehnhardt, Bente, & Vogeley, 2011). This is relevant for all the different formats of informal social encounters such as “small talk” or the generation of “first impressions”, which rely substantially on nonverbal communicative signals such as gaze, facial expression, and gesture.

This also affects professional life, often leading to difficulties in obtaining and maintaining employments (Barnard et al., 2001; Howlin, 2013) with high rates of unemployment of more than 40% in individuals with high-functioning autism (Engström, Ekström, & Emilsson, 2003; Kirchner & Dziobek, 2014; Proft, 2012) and up to 95% in autistic individuals with intellectual disability (Hofvander, Delorme, Chaste, Nydén, Wentz, Ståhlberg, Herbrecht, Stopin, Anckarsäter, Gillberg, et al., 2009; Howlin et al., 2004; Lin et al., 2012; Valkanova, Rhodes, & Allan, 2013). The lack of productivity due to unemployment has been reported as the most important factor contributing to estimated lifetime societal cost per person with autism of \$3.2 million in the USA (Ganz, 2007). High unemployment rates further lead to social isolation, low self-esteem, stress, and comorbid disorders, including depression in approximately 40% of autistic persons (Gawronski, Pleiffer, & Vogeley, 2012; Proft, 2012; Strunz, Dziobek, & Roepke, 2013; Taylor & Hodapp, 2012). Although many autistic persons are able to compensate for deficits in social cognition to a certain degree by applying probabilities or rules for the occurrence of nonverbal cues they remain unable to react intuitively, i.e., spontaneously and sufficiently fast to the affordances of complex social systems. As a consequence, individuals with autism are more likely to lose employment because of social interaction problems rather than difficulties with work task performance (Hurlbutt & Chalmers, 2004).

The German health care and social care systems and those of other countries (Macleod, 1999) are to date not adequately prepared for the proper support of individuals with HFA. This is at least partly due to the fact that HFA was not sufficiently noticed until 1994, when Asperger Syndrome (AS), the “mild variant” of autism, was included into the DSM-IV as an autism spectrum disorder (ASD). Thus, high-functioning autistic individuals

born before 1994 have not been in the scope of early childhood care focusing on ASD. This implies that a considerable group of persons with HFA/AS (in the following referred to under the umbrella term of HFA) might still be undiagnosed or misdiagnosed and that instruments are lacking to support and promote the re-integration of these individuals into professional and societal life.

3.2.3 AUTISM AND (UN-)EMPLOYMENT

Although epidemiological data on ASD in Germany are lacking, one can - on the basis of recent international studies (Baird et al., 2006; Elsabbagh et al., 2012) - assume a culture-independent life time prevalence of approximately 1% for ASD with a proportion of about 50% for HFA. This corresponds to approximately 800.000 Germans with ASD and 400.000 with HFA, respectively. Studies on psychosocial functioning show that a high proportion of autistic individuals are unsuccessful in establishing and entertaining social relationships, most prominently due to communication and interaction deficits associated with the disorder.

These deficits result in problems not only in the private life of individuals with ASD but also in their professional lives, contributing to high rates of unemployment (Lehnhardt et al., 2012; Proft, 2012). Although representative studies on employment in ASD are non-existent to date, studies reporting outcome in ASD with intellectual disability show that employment rates are as low as 5% (Baumgartner, 2009; Eaves & Ho, 2008; Hofvander, Delorme, Chaste, Nydén, Wentz, Ståhlberg, Herbrecht, Stopin, Anckarsäter, & Gillberg, 2009; Howlin et al., 2004; Lin et al., 2012). In HFA unemployment rates are also disproportionately high: We found a rate of unemployment of more than 40% in 293 patients with HFA that were seen in the Autism Outpatient Clinic Cologne (Proft, 2012). Considering the recent unemployment rate of 6.8% in the Federal Republic of Germany (Bundesagentur für Arbeit, 2013) this is an alarming finding, especially when considering the high educational level and relatively young age (beginning of fourth decade) of those individuals. The high unemployment rates are also reflected in low quality of life (QoL) in adult HFA (Kamio, Inada, & Koyama, 2012; Kamp-Becker, Schröder, Remschmidt, & Bachmann, 2010; Renty & Roeyers, 2006; Saldaña et al., 2009; Totsika, Felce, Kerr, & Hastings, 2010) and are furthermore associated with emotional-behavioral and health problems (Taylor & Hodapp, 2012).

3.2.4 SUPPORTED EMPLOYMENT PROGRAMS

Both nationally and internationally only very few structured programs are available that would allow the systematic study of efficacy of supportive care with the purpose of (re)integration of individuals with ASD into employment. In a very interesting recent randomized clinical trial in individuals with ASD between 18 and 21 years of age employment outcomes were much higher (87.5%) in the treatment group compared to the control group (6.25%) (Wehman et al., 2014). Treatment involved among other instruments of intervention consultations with a behavior analyst and intensive social skill instruction through role play and behavioral practice. Prior to that study, a 2012 review article on the effects of adult employment assistance services for individuals with ASD (Westbrook et al., 2012) had identified only one study that fulfilled the criteria of experimental designs and specifically focused on employment outcome: In a quasi-experimental design study by Mawhood and Howlin (1999) employment outcome was compared between an experimental group ($n = 30$) that received support with job finding, work preparation, and communication with the employers and a control group ($n = 20$), which did not receive any support. After a period of two years the experimental group demonstrated significantly higher rates of employment (63%) than the control group (25%).

A non-experimental study by Howlin and colleagues (Howlin et al., 2005), in which adults with autism and an IQ of at least 60 were followed up over a period of 8 years, reported an employment rate of 68% after a supported employment service was undergone. Another study has shown that vocational rehabilitation programs have a beneficial impact on cognitive performance in individuals with autism (García-Villamizar & Hughes, 2007). A randomized control study that evaluated the effectiveness of an internet-based training program focusing on job interview situations showed that the treatment group of 11 ASD persons demonstrated significantly more effective verbal skills than the control group (Strickland, Coles, & Southern, 2013).

More supported employment programs (SEP) for adults with autism, are needed and especially rigorous research is lacking showing their effectiveness. Generally speaking, although some attempts to place autistic persons in any form of employment have been undertaken (e.g. “specialisterne”, Denmark; “Passwerk”, Belgium; “auticon”, Germany, “Füngeling Router”, Germany), the German health and social care systems are not adequately prepared for the proper support of this group of persons. Scientifically speaking, the evidence about any kind of employment-related supportive services for adults with ASD

is underdeveloped and can be considered a research desiderate given the demographic data above and the alarmingly high unemployment rates. Moreover, the currently available research does not consider demographic factors, the degree of heterogeneity of impairments in the autistic population, and other issues that are relevant for external validity (Shattuck et al., 2012). Most previous studies on vocational interventions reporting that on-the-job supports may promote employment in the community have been evaluated as being of poor scientific quality (Taylor et al., 2012; Westbrook et al., 2012). Another important aspect is that the available studies almost exclusively focus on adolescence and early adulthood, with no research into effective intervention programs specifically for adults as they reach mid to late adulthood (Howlin & Moss, 2012).

In our opinion, professional and scientifically grounded supported employment programs (SEP) are urgently needed. Such SEPs for individuals with HFA would require at least i) the adequate assessment of HFA persons, including neuropsychological and sensory profiles as well as an individual matching of persons preferences and strengths with requirements of the working place, ii) “coaching on-the-job” activities, including systematic communication and interaction training, and iii) the instruction of non-autistic peers, including colleagues and supervisors, about HFA. Below we develop a framework for such a supported employment program for individuals with HFA.

Table 11. Schema of a Supported Employment Program (SEP) for High-Functioning Autism (HFA)

Elements	Activities
Assessment	Clinical diagnosis, differential diagnosis, diagnosis of comorbidities Neuropsychological profile (intelligence, attention, executive functions) Profile of special needs relevant for work space (e.g. sensory hypersensitivities) Profile of interests and affinities
Job coaching	<u>Off-the-job coaching (group setting)</u> <ul style="list-style-type: none"> • Training of social skills via role play (e.g. job interview , phone call with client) • Training of social skills via new media (e.g. virtual reality employment game “I-Spectrum”) <u>On-the-job coaching (individual)</u> <ul style="list-style-type: none"> • assistance with difficult work situations (e.g. social interaction problem with colleague)
Instruction of non-autistic peers (colleagues and superiors)	<u>Educational sessions for co-workers</u> <ul style="list-style-type: none"> • Teaching of ASD symptomatology (e.g. peculiarities in social interaction such as reduced eye contact, little interest in small talk) <u>Individual coaching for superiors</u> <ul style="list-style-type: none"> • Discussing aspects of leadership for autistic persons (e.g. communicating goals explicitly, avoiding mental underload, providing sensory adequate work environment)

3.2.4.1 IDENTIFICATION OF SPECIFIC NEEDS

A first and important step is the identification of specific needs both of the autistic person him/herself and the working environment. Whereas needs and requirements in working environments from the perspective of employers are in general adequately covered by job specifications, the perspective of employees has been a matter of organizational and vocational psychology. The most prominent theory is the empirically well-grounded so-called two-factor theory going back to Herzberg according to which two groups of influential factors play an important role in job satisfaction. One group of factors has the potential to cause satisfaction (so-called “motivators”, e.g. new challenges, recognition, responsibility), the other group of factors can cause dissatisfaction (so-called “hygiene factors”, e.g. job security, salary, physical work conditions). Both groups of factors are considered to be non-complementary and act independently from each other (Herzberg, 1966, 1968). Following this theory, employers need to take both factors into account. Although well studied in the general population, we do not know anything about these different influential factors in specific groups of mentally handicapped persons, including HFA individuals. Hence, an adequate matching procedure between needs, requirements, talents, and affinities of HFA individuals on the one hand and the characteristic affordances of a concrete working place

is highly desirable. It has been speculated that HFA persons are affected by unemployment because they are often overqualified for sheltered workshops and other employment offers by social services (Baumgartner et al., 2009) reflecting a violation of motivating factors.

In order to develop a disorder-specific SEP in a demand-oriented manner, we recommend to systematically and carefully survey adults with HFA concerning their experiences, needs, and expectations relating to job specifications. We favour a two-step approach comprising qualitative content analysis by Mayring (Mayring, 1994, 2007)] and a subsequent quantitative analysis employing a self-developed questionnaire. This recommendation is based on our own experiences in the development of a tailored group psychotherapy manual based on qualitative content analyses of needs and requirements of HFA patients (Gawronski et al., 2011; Gawronski et al., 2012) and based on our experiences with pilot studies targeting specific experiences and needs of HFA persons in their working environment (Proft, 2012) and exploring special interests of autistic persons (Kirchner & Dziobek, 2014).

3.2.4.2 *ELEMENTS OF SUPPORTED EMPLOYMENT PROGRAMS*

Assessment

At the initial phase of the SEP a comprehensive clinical and neuropsychological assessment is crucial. Besides a careful clinical diagnosis (Lehnhardt et al., 2013) a neuropsychological test battery should be applied that should include at least attention, executive functions, and intelligence measures (Lehnhardt et al., 2011). In addition, it is important to assess specific needs of individuals with HFA related to the work space (e.g. sensory hypersensitivity) and to develop a profile of talents and affinities of the individual person to be re-integrated. Although already Hans Asperger (1944) claimed that special talents and interests of autistic persons can lead them to outstanding achievements, the question of special interests has been largely ignored by the scientific community and has focused almost exclusively on children and adolescents (Klin et al., 2007). Instruments to assess talents and affinities specifically in persons with HFA have yet to be developed. However, Gal and colleagues (2013) recently published the Autism Work Skills Questionnaire (AWSQ), a comprehensive self-report assessment of a person's vocational profile, which aims to produce a good person-job match. The questionnaire contains among others scales of work style, independence level in work and studying, and sensory work environment needs. Other scales, which were not specifically developed for ASD, can in

addition be useful to measure working preferences, such as the German Allgemeiner-Interessen-Struktur-Test (AIST, Bergmann & Eder, 2005), which assesses six interest domains (realistic, investigative, artistic, social, enterprising, conventional). Although it has been suggested that persons with HFA hold special interests and talents primarily in the field of natural sciences including computer science (Baron-Cohen, 2009), it is important to note that interests are in fact more diverse. In a recent study with 76 individuals with HFA (Kirchner & Dziobek, 2014) we found special interests to lie in the field of social sciences and creative fields nearly as often as in the domain of natural sciences and technology.

With respect to intellectual capacities, it is interesting to note that mental underload was rated as an important factor interfering with work performance in that study, while excessive demands were not (Kirchner & Dziobek, 2014). Misunderstanding the often enough not clearly visible, underdiagnosed, or misdiagnosed social communicative deficits in HFA as intellectual deficit, autistic persons appear to work too often in positions in which the intellectual challenge does not meet their cognitive capacities and leads to a low degree of recognition and responsibility with respect to their work. One could assume that this aspect is closely related to the issue of “motivators” according to Herzberg (1966, 1968).

Another interesting aspect relates to the concrete working environment, where physical features of the working place (e.g. lights, sounds, smells, temperature) might irritate autistic employees and elicit negative reactions. As a consequence, many autistic persons indicated a quiet and undisturbed working place would be highly desirable (Kirchner & Dziobek, 2014; Proft, 2012). Easily we can recognize the second group of so-called hygiene factors according to Herzberg (Herzberg, 1966, 1968). In summary, the current working environment of many autistic persons nowadays has to be characterized by a decreased number of “motivators” that potentially provide less satisfaction and by a decreased number of “hygiene factors” that – if absent – increase dissatisfaction. In other words, the current employment situation of autistic persons clearly calls for improvement.

Job Coaching

We consider job coaching as a very important component of SEP for autistic individuals. Indeed, assistance on-the-job was found to be among the most important interventions in ASD employment programs (Westbrook et al., 2012). For example, Burt et al. (1991) describe the successful use of behavioral techniques such as modeling, role play, and behavior modification techniques in four autistic adults as part of a 4-month work program. Furthermore, job coaching was one of the aspects Müller et al. (2003) found to be important by interviewing 18 persons with HFA about job experiences. It was suggested that job coaches could simulate difficult situations such as job interviews and provide practical assistance with e.g. administrative aspects. Lawer et al. (2009) showed that employment appears to be highly associated with on-the-job support. A combination of different formats of training and job-site assistance was identified as the best practice for teaching vocational skills, which appears to be more effective if supplemented with simulation training (Lattimore, Parsons, Reid, & Ahearn, 2006).

Based on our experience with a demand-based group psychotherapy for adults with HFA (Gawronski et al., 2012) we expect that the duration of a successful intervention probably comprises a period of 12 months, of which at least 3 months should focus on training and education in a group off-the-job setting with a group size of up to 6 patients and one session per week. This should be followed and complemented by a period of up to 9 months training on-the-job, with individual contacts at least once per week.

We see a special potential in the use of new media in job coaching efforts for autistic individuals. Mediated communication situations imply a certain delay between action and reaction as well as a focus on verbal content instead of nonverbal cues, which poses less problems for persons with HFA. This is indeed the fact in many forms of mediated communication and in particular for text-based computer-mediated communication (CMC) (Walther & Parks, 2002). Consequently, the use of new media could assist those with HFA in maintaining social networks and in facilitating everyday communication tasks at the job.

First evidence that media play an important role for people with HFA has been already provided in a number of studies. For instance, it was shown that the specific communication advantages the internet offers can be of benefit for individuals with HFA (Benford & Standen, 2011; Standen & Brown, 2005). This could potentially be exploited for employment purposes, by e.g. using internet job interviews or online questionnaires

(Benford & Standen, 2009). An initiative within the European Lifelong Learning Program developed “I-Spectrum” for autistic persons, a virtual reality game in which social interaction in work settings can be trained online. In addition, tools exist that train social skills more generally. For example, Golan and colleagues (2006) reported positive evidence for a computer-based emotion recognition training in adults with HFA. Moreover, positive evidence regarding the effectiveness of a virtual reality training comes from a pilot study from Kandalafi and colleagues (2013), who report significant increase in social cognitive measures as well as in real life social and occupational functioning after a five-week virtual reality social cognition training intervention in adults with HFA.

Instruction of Peers

Interacting with colleagues, superiors, and clients is a crucial part of almost every job. While HFA involves an intelligence level often above average, peers tend to misunderstand the inadequate social behaviour and interpret it as odd, inadequate, arrogant, or narcissistic. This in turn might lead to many unsuccessful social encounters and sometimes the inability to keep employment. In fact, it has been suggested that individuals with ASD are more likely to lose their job because of problematic social interactions rather than an inability to perform work tasks (Hurlbutt & Chalmers, 2004). Interestingly, it appears that to date this essential component of knowledge and acceptance by peers, which obviously is a necessary prerequisite for integrating autistic persons into their working environment, has been widely neglected. Teaching of colleagues and superiors should comprise knowledge about ASD diagnostic criteria, including peculiarities in communication and social interaction. In addition, possible ways of successful interactions with affected persons should be trained such as expressing needs explicitly and verbally rather than through subtle non-verbal cues, which are likely to be missed by autistic individuals. Supporting the importance of peer instructions, Keel and colleagues (Keel et al., 1997) found those work settings for people with ASD most appropriate, which ensure employers and colleagues are knowledgeable about the autism spectrum.

Of note, our own empirical study revealed awareness of employers and colleagues about the ASD diagnosis of the individual employee to be one of the factors most often reported to facilitate work performance by affected individuals (Kirchner & Dziobek, 2014). Thus, training and instruction of colleagues, peers, and supervisors are obviously important ingredients of an SEP for autistic persons.

3.2.5 CONCLUSIONS

Despite good education, individuals with HFA appear to stay clearly beyond their full potential with respect to occupational (re)integration. According to the two-factor motivation theory of Herzberg, autistic individuals often have to cope in working environments in which motivating factors such as new work challenges or a high degree of recognition of one's work are lacking and at the same time miss extrinsic factors like adequate working places taking e.g. sensory peculiarities into account ("hygiene factors"). Following Herzberg, this is the most disadvantageous scenario: A lack of motivators hinder job satisfaction, while a lack of hygiene factors lead to additional job dissatisfaction. One important aspect related to intrinsically relevant motivators concerns the special interests of individuals with HFA. As outlined above, recent data (Kirchner & Dziobek, 2014) provide important evidence that special interests of autistic persons are diverse and bear much potential for employment beyond technical and natural sciences fields. Recent efforts to create job opportunities in the information technology sector should therefore be extended to other domains such as human and social sciences as well as creative fields.

To address the specific needs of the German health system would require a collaborative and interdisciplinary research project that would study psychosocial functioning in HFA in adulthood, including quality of life, and to identify specific needs and potential supportive measures necessary for autonomous living as well as social integration and inclusion. To achieve this goal we suggest to consequently take the perspective of the target group of HFA individuals, making use of qualitative empirical methods (content analysis of self-reports) to explore the problematic issues with respect to employment and their consequences for everyday life. More specifically, we should pursue to systematically study the abilities to communicate and interact as well as to describe the circumstances and conditions of social relations in the framework of HFA individuals' working environments. We need to identify needs and possible measures for improvement in social communication, societal participation, and inclusion of HFA persons in their working environment, and to analyze the potential of new media as an aid for affected individuals in establishing and maintaining social contacts in professional life.

We demonstrate here not only a lack of adequate supported employment programs for individuals with HFA but also the poverty of research that addresses the efficacy of such interventions. The scientific quality of the existing evidence is weak and thus there is a clear need for more rigorous studies on the effectiveness of employment programs for individuals

with ASD. Finally, systematic follow-up studies from childhood through adulthood are needed in order to improve our understanding of the school and vocational development over the lifespan, to identify the relevance of this issue for the overall psychosocial prognosis and to understand how these factors can be modified for the benefit of autistic individuals (Howlin & Moss, 2012).

4 DISCUSSION

“The hallmark of an enlightened society is its inclusion of non-dominant behaviors and phenotypes [...].”

Laurent Mottron, Nature, 2011

4.1 DISCUSSION OF PART I: STRENGTHS RELATED TO PERSONALITY

The aim of the first part of this dissertation was to advance the knowledge regarding strengths related to personality in high-functioning autistic adults. Taken together, studies 1 and 2 provide new insights into strengths related to their personality using explicit and implicit measures. In study 1, we assessed character strengths with the VIA-IS and analyzed signature strengths and associations of character strengths with satisfaction with life, whereby several areas of applications of the study results towards more positive outcomes in high-functioning autistic individuals are discussed in the following. In study 2, we found first evidence regarding a reduced level of social bias in autistic individuals applying an IAT, although future studies are needed to understand the specific underlying mechanisms that cause the reduced IAT effect found in our study.

4.1.1 AREAS OF APPLICATION FOR CHARACTER STRENGTHS

In study 1 (Kirchner et al., under review), character strengths were assessed with the Values in Action Classification of Strengths (VIA-IS, Peterson & Seligman, 2004) and associations between character strengths and levels of satisfaction with life were explored. The results of the study showed that high-functioning autistic individuals had lower scores in most emotional and interpersonal character strengths compared to neurotypical individuals, although they did not differ in most intellectual strengths and strengths of restraint. Signature strengths - i.e. top-ranked strengths within an individual's strengths ranking - were mostly intellectual strengths in the ASC group, while the signature strength profile of the neurotypical group was characterized by emotional and interpersonal character strengths. Interpersonal and emotional strengths had the strongest positive associations with satisfaction with life in the ASC group.

Studying character strengths provides a new perspective on personality in high-functioning autistic individuals beyond psychopathological concepts. The knowledge about character strengths can be used toward different aims. In the following, I will briefly outline how character strengths can be useful towards: 1) interventions targeting well-being; 2) building up motivation and rapport in working with individuals with a history of poor achievements; and 3) interventions targeting job placement. Please note that while we described and compared character strengths on a group level to draw conclusions on typical character strengths in this research study, obviously for intervention or coaching purpose the individual analysis of the character strengths is more warranted.

First, we found substantial associations between character strengths and satisfaction with life in high-functioning autistic individuals, replicating similar findings in neurotypical individuals. Out of the 24 character strengths, we found that *hope, zest, kindness, humour, social intelligence* and *teamwork* have the strongest correlations with satisfaction with life in high-functioning autistic individuals. This is remarkably, given that all of these strengths are emotional or interpersonal strengths. This contradicts the notion of the autistic individual who prefers isolation rather than social contact and underlines the importance of training these strengths. Even though our data is cross-sectional, meaning that we cannot infer causation between variables, there is evidence (in neurotypical individuals) that training those character strengths associated with satisfaction with life increases satisfaction with life (Proyer, et al., 2013).

Second, the knowledge about character strengths can be considered a valid supplement to other more deficit-oriented diagnostic information for professionals who plan any kind of intervention. Especially the analysis of signature strengths has been fruitful in working with individuals with a history of poor achievements, given that such individuals often experience frustration if they constantly have to work only on problems and deficits (Park & Peterson, 2009). It has been shown that (neurotypical) individuals who received feedback about their signature strengths and subsequently used them in novel ways show improved satisfaction with life (Seligman et al., 2005). Given that signature strengths are those that the individual already possesses, they are important resources that can facilitate the start of interventions by creating positive experiences and increased self-esteem and motivation.

Third, character strengths can serve as important information for job placement services. For example, Harzer (2008) reported first data establishing typical profiles of signature strengths for different professions (in neurotypical individuals). In our study, we found *open-mindedness, creativity, love of learning, authenticity and fairness* to be the most common signature strengths in autistic individuals. The profiles reported by Harzer can guide as an orientation regarding which signature strengths are typical for specific occupations. For example, Harzer reported *open-mindedness* as a top-ranked signature strength among economists, lawyers, mathematicians and administration specialists. *Love of learning* was found to be a top-ranked signature strength for engineers, doctors, pharmacists, consultants, and librarians. The importance for the fit of character strengths and requirements of the job is underlined by studies (in neurotypical individuals) showing the applicability of

signature strengths as an important factor for positive experiences at work (i.e., job satisfaction, pleasure, engagement, and meaning) (Harzer & Ruch, 2012), task performance, and job dedication (Harzer & Ruch, 2014). The extent to which each of the 24 character strengths can be applied in a certain work (or private) setting can be assessed with the *Applicability of Character Strengths Rating Scales* (ACS-RS, Harzer & Ruch, 2012). The importance of job placement services has been underlined by Migliore and colleagues (2012), who identified job placement services as the strongest predictor for autistic individuals finding employment after a vocational rehabilitation program.

In summary, there are multiple areas of application where the knowledge about character strengths can be beneficial for high-functioning autistic individuals. Studies within this population have to show whether the specific results reported above for neurotypical individuals (e.g. impact on satisfaction with life, associations with job profiles) are comparable for high-functioning autistic adults.

4.1.2 SPECIFICITY OF REDUCED SOCIAL BIAS

The core symptomatology of autistic individuals comprises problems in social cognition, including difficulties in interpreting social information (Baron-Cohen, 2000) and reduced attention towards social stimuli (Dawson, Meltzoff, Osterling, Rinaldi, & Brown, 1998). Based upon this symptomatology, we (and others, e.g., Hamilton & Krendl, 2007) hypothesized that high-functioning autistic individuals would be less prone to developing social bias such as prejudice or stereotypes, given that they would be less likely to learn social information.

In study 2, we tested the hypothesis of reduced implicit social bias in high-functioning autistic individuals by assessing automatic stereotypical attitudes towards minorities with an Implicit Association Test (IAT, Greenwald, McGhee, & Schwartz, 1998). We chose an implicit measure to avoid effects of social desirability, which is a strong concern in any research study assessing stereotypes and prejudice. The magnitude of the IAT effect is interpreted as reflecting the strength of automatic stereotypes. Our results suggested reduced automatic stereotypes in high-functioning autistic individuals compared to neurotypical individuals. One problem with this finding is that it could indicate either reduced social bias or generally reduced effects in the IAT paradigm owing to IAT-specific method variance. This concern was recently addressed in an informative study conducted by Birmingham and colleagues (2015), who applied different IATs using social (gender, race)

and non-social (nature, shoes) categories in high-functioning autistic and neurotypical individuals. Their findings replicate a reduced IAT effect in the ASC group, however, reduced IAT effects were found in social and non-social IATs. The authors thus conclude that the processes underlying reduced IAT effects do not seem specific to social information. They suggest that processes underlying the observed attenuated IAT effects in ours and in their study result from non-social cognitive processing differences between autistic and neurotypical individuals rather than from problems in the social domain.

An alternative explanation is that different mechanisms underlie the reduced IAT effects in the social and non-social domains. In support of this interpretation, Birmingham and colleagues found some evidence indicating a relationship between increased severity of social affective autistic symptomatology and a reduced IAT effect. In detail, they report a significant negative association between a score representing the severity of the social affect domain with the magnitude of the race IAT effect. As this finding is not consistent across various similar symptomatology scores, the authors hesitated to interpret this result, however, they suggest that replication studies with larger sample sizes should explore this relationship.

However, even the interpretation of social biases is not unequivocal. In our study, we propose that the reduced automatic stereotypes regarding a minority are a strength, while White and colleagues (2006) interpret the intact ability to make (stereotypical) social judgements from photographs as an islet of ability, given that they perceive it as preserved aspects of social knowledge. This different interpretation might seem contradictory upon first consideration, however, it rather shows that it is too simplistic to interpret the results in categories of positive or negative, given that stereotypes can be both, fast accessible social knowledge useful for navigating in a complex world, or malicious in the form of inflexible categorical thinking, which can lead to prejudiced behavior. There are also other behaviors associated with autistic symptomatology that can be interpreted as positive or negative depending on the context. For example, Izuma and colleagues (2011) showed that autistic individuals are less likely to adapt their behavior to manage their reputation. This can lead to the interpretation of autistic individuals being honest or authentic (which could be considered a strength), whereas in other situations it is perceived to be a weakness, when individuals fail to present themselves in a positive fashion; for example, in job interviews.

Overall, in study 2 of this dissertation we found evidence of a reduced social bias in autistic individuals as indicated by reduced IAT effects. However, the underlying mechanisms remain unclear and a recent study by Birmingham and colleagues (2015) challenged the interpretation that this effect is driven by mechanisms specific to social stereotypes. Given that only two studies to date have applied the IAT in autistic individuals, further studies are needed to understand the underlying mechanisms causing the reduced IAT effect in more detail. For this purpose, social and non-social IATs have to be applied, as well as other measures associated with the IAT effect (e.g. executive functioning).

4.2 DISCUSSION OF PART II: TOWARDS EMPLOYMENT

The second aim of this dissertation was to better understand the factors that contribute to successful employment. For this purpose, a questionnaire was developed to assess special interests with a focus on vocational use and factors deemed important for vocational performance (study 3). Our results show that fields of special interests are distributed almost equally among *natural sciences and technology/engineering*, *human and social sciences* and *creative fields* and that systemizing is the most common approach towards the special interest in high-functioning autistic adults. Furthermore, we identified a range of factors - such as perceptual and social characteristics - as well as mental underload that interfere with work performance. In addition, the knowledge about the employee's autism diagnosis in superiors and colleagues was one of the most commonly rated facilitating factors. Characterization of the special interest regarding their field and approach can help to inform job placement strategies. Furthermore, the individual assessment of factors possibly influencing work performance (such as communicative and perceptual characteristics) is necessary. The results of study 3 were vital in the subsequent development of the outline of a supported employment program (SEP) towards a better inclusion of autistic individuals in the job market (study 4). In study 4, we systematically presented the elements that a supported employment program should comprise (*assessment, job coaching and instruction of peers*).

4.2.1 CHARACTERISTICS OF SPECIAL INTERESTS

In study 3, we assessed special interests with potential for employment and the factors deemed important for vocational performance in high-functioning autistic individuals with a questionnaire developed in collaboration with a focus group of autistic individuals. Special interests lay almost equally distributed in the field of natural sciences

and technology/engineering, human and social sciences and creative fields, with a descriptive tendency towards more interests in natural sciences and technology/engineering. We identified three different approaches taken towards the special interests: the systemizing, creative and knowledge collecting approach. The most common approach taken was systemizing. Factors most commonly rated as interfering with work performance were a lack of cognitive challenge, social and perceptual problems. Awareness about the employee's diagnosis by employers and colleagues was most commonly identified as a facilitating factor for work performance.

Analyzing discussions in internet forums, Jordan and Caldwell-Harris (2012) found autistic individuals to describe a greater number of interests than neurotypical peers in the areas of *science, history and culture, belief systems, animals, information and mechanical systems, machines and technology and vehicles*. The number of interests in *creative arts* was comparable with the neurotypical individuals. The strongest difference between the groups was in science, with 20% of high-functioning autistic individuals reporting a strong interest in science and only 3% of the neurotypical individuals. The authors interpreted their findings as *systemizing* being a common cognitive style towards this interests, which is in line with systemizing being the most common approach towards special interests in our study (Kirchner & Dziobek, 2014). In a following study, Jordan and Caldwell (2014) proposed a model that perceives special interests on a continuum with hobbies of neurotypical individuals, with the autistic interests typically more associated with systemizing and hobbies of (female) neurotypical individuals typically more associated with empathizing.

In a study by Lorenz and Heinitz (2014), *systemizing* was among the most commonly rated strengths (among *attention to detail, logical reasoning, reliability, focus*) that high-functioning autistic individuals chose from a list of 26 potential strengths. Furthermore, the authors analyzed the job interests of their study participants (N= 136) based upon Holland's RIASEC model (Holland, 1997), which distinguishes between six categories of interest types (realistic, investigative, artistic, social, enterprising or organizing), finding that high-functioning autistic adults score highest (and significantly higher compared to neurotypical controls) on *realistic* and *investigative* job interests, which characterizes them as the I-R interest type. According to Holland, individuals with *realistic* interests see themselves as practical minded and concrete and curious about the physical world. The *investigative* interest domain comprises analytic, scientific and academic interests, whereby individuals

scoring high on this interest domain enjoy working with theories and facts, which again reflects their tendency towards systemizing.

The participants in our study reported spending an average of 26 hours a week on their special interests and rated their average level of proficiency as very good, which indicates a strong motivation towards the special interests. Support towards this notion comes from a recent study from Grove and colleagues (2015), who analyzed the motivation of autistic individuals towards their special interests. Interestingly, they found that they showed higher levels of intrinsic interest and knowledge and engagement and flow, indicating that autistic individuals are more strongly motivated by intrinsic factors towards their special interests compared with neurotypical individuals. This is also especially relevant for employers, as intrinsic motivation has been shown as a predictor of work outcomes (Saperstein, Fiszdon, & Bell, 2011), which renders the consideration of special interests a crucial aspect of job placement considerations.

In sum, knowledge about special interests in high-functioning autistic adults is slowly growing and there is increasing evidence that special interests are often related to the cognitive style of systemizing. Research efforts should be devoted towards developing assessment tools that allow for more standardized assessment of various aspects of special interests and a better characterization of the level of skills. Furthermore, strategies concerning how to implement this special interests in work routines have to be conceptualized and evaluated.

We also showed in our study that other important factors (such as social and perceptual characteristics and needs) have to be assessed and considered in this population to achieve an optimal fit between job and individual in addition to the consideration of skills in a certain area. Our data suggests that the awareness about the employee's autism diagnosis by superiors and colleagues is one of the most important factors towards successful employment, together with certain characteristics at the work place such as having quiet surroundings and an undisturbed working space. Furthermore, problems with superiors and colleagues were among the most commonly reported factors interfering with work performance. In line with this, Lopez and Keenan (2014) showed that the lack of understanding regarding the autism diagnosis by employers and colleagues and the failure to make appropriate adjustments at the work place was the most commonly reported obstacle towards successful employment in their sample (N=46) of (mostly high-functioning) autistic teenagers and adults. The authors suggested that autism awareness training for employers

and staff could pave the road towards a better understanding and mediation of the needs of all parties involved. This strategy is supported by the results of Lorenz and colleagues (2016), who found high-functioning autistic individuals to experience less social problems in autism-specific jobs vs. with no autism-specific jobs.

In line with our finding that more than half of our participants had experienced mental underload as an impairing factor regarding work performance, Baldwin and colleagues (2014) also reported issues related to *boredom* being one of the most commonly stated negative work experiences, with 46% of the high-functioning autistic study participants being “overeducated⁹” for their present employment. Overall, more efforts have to be made to support high-functioning autistic individuals obtaining and maintaining employment. Adjustments regarding factors that impair work performance such as perceptual and social issues have to be mediated with employers. Moreover, cognitive underload should be avoided.

4.2.2 NEED FOR SUPPORTED EMPLOYMENT PROGRAMS

In study 4, my co-authors and I revised evidence showing that high-functioning autistic individuals often stay behind their potential with respect to employment opportunities. Referring to Herzberg’s two-factor motivational theory (1966), we summarized that high-functioning autistic individuals often experience unfavorable work conditions, including both motivational (such as interesting work tasks, recognition of personal strengths) and hygienic (such as work environment, salary) factors. Many of the existing employment services are designed for individuals with comorbid intellectual disabilities and thus do not meet the need of high-functioning autistic individuals. Therefore, we argued that supported employment programs (SEP) that focus specifically on high-functioning autistic individuals are needed in Germany and other countries. Such SEP should comprise: (1) comprehensive assessment (e.g. diagnosis, neuropsychological profile, profile of special needs regarding work environment, profile of interests and affinities); (2) job coaching (off-the-job and on-the-job); and (3) the instruction of non-autistic peers at the workplace (e.g. autism symptomatology, strengths related to autism, leadership related issues).

⁹ Baldwin and colleagues (2014) define “overeducation” as a situation in “which a worker holds a level of formal education that exceeds the required level of education for the job in which he is employed” (p.2441)

In line with our claims, Katz and colleagues (2015) underlined the importance of “a good person-employer match” and described the goal of a supported employment program as providing the autistic individual “with a working environment that meets not only his professional tendencies, but also his cognitive and social-communication abilities and his sensory profile” and (p.891). They recently published promising results of a SEP comprising similar elements to those that we suggested (intensive assessment of work skills, preparation for working life, placement according to skills and preferences, job-coaching on the job). All 26 high-functioning autistic participants were still employed on the open job market after nine months after the program and reported increased quality of life.

Also Chen and colleagues (2014) underline in their review the importance of employment-related services for autistic adults, as employment increases an individual’s social status, financial independence and contributes to quality of life, including by maintaining physical and psychological health. Chiang and colleagues (2013) found social skills and career counseling to be important predictors for participation in employment: the chance that an autistic high school leaver with high social skills participated in employment was five times larger as opposed to one with low social skills, while a similar effect was found for career counseling. These results underline the importance of social skill trainings and job guidance as part of supported employment programs, as we suggested.

Maintaining a job can be equally (or even more) challenging as obtaining one (Taylor, Henninger, & Mailick, 2015). In a longitudinal study looking at post-secondary education and employment patterns over time, the authors found that many high-functioning autistic individuals were able of securing competitive employment, albeit having difficulties in maintaining the employment. While two-thirds of study participants were engaged in competitive employment or post-secondary education at some point over the study period, only 25% were engaged in these activities over the whole time period. This study underlines the importance of services that also continue when employment is obtained. In line with this, Baldwin and colleagues (2014) report that two-thirds of their employed high-functioning autistic study participants indicated their wish to receive more support at work related to their ASC.

The positive trend of the development of new virtual reality tools aiming to help autistic individuals to overcome obstacles in the work place has continued in recent years. For example, internet supported or virtual reality job interview training (Smith et al., 2014, 2015; Strickland et al., 2013) or iPad applications for organization, scheduling and social

interaction (Hill, Belcher, Brigman, Renner, & Stephens, 2013) have been developed. Given the affinity towards information technology tools in the autistic population, professionals should consider integrating those tools into SEPs. Virtual reality tools could also help to - at least partly - overcome - the problem of limited access to autism-specific employment services in rural areas.

In sum, there is consensus about the importance and utility of specific supported employment programs for high-functioning autistic individuals, which should continue to offer support to those individuals who have found employment. Social skills training, job placement counseling and an environment that fits the needs of the autistic employee not only on the skill level but also matches perceptual and social cognitive characteristics seem to be among the most important characteristics and goals of such SEPs. Virtual reality tools can complement such programs.

4.3 GENERAL DISCUSSION AND FUTURE DIRECTIONS

The goal of this dissertation was to complement the more deficit-oriented traditional model of autism with a strength-oriented approach, broadening the knowledge about aspects that hold relevance for positive outcomes in high-functioning autistic adults. In studies 1 and 2, my co-authors and I characterized strengths related to the personality in high-functioning autistic individuals and in the corresponding discussion section I review different areas of application where the knowledge of character strengths can be valuable. Furthermore, with the example of reduced social bias, I discuss the notion that labeling a certain characteristic as a strength or a deficit can be equivocal depending on the context. In study 3, my co-author and I assessed special interests with potential for application in the vocational context and other factors that are deemed important for work performance in a study sample of high-functioning autistic adults. We found special interests to lay in various fields and systemizing to be the most typical approach. Given high levels of proficiency, my co-author and I considered these special interests as important sources for employment strategies. Furthermore, we consider the impairing and facilitating factors - which we identified regarding employment - as highly relevant to inform employment programs. Building on our results from study 3 and a review of the literature, my co-authors and I proposed and outlined a supported employment program (study 4). Taking together the results from all studies, I conclude that high-functioning autistic individuals possess strengths that can be instrumental to improve outcomes, such as employment and satisfaction with life. Certain characteristics

such as social and perceptual problems have to be considered to allow for successful employment.

In the following sections, I will discuss aspects related to employment research in high-functioning autistic adults that I consider relevant for future research in the area and draw attention to the controversy regarding the research agenda on autism. Finally, I will discuss opportunities and limitations of the strengths-focused research approach.

4.3.1.1 FUTURE RESEARCH ON EMPLOYMENT IN HIGH-FUNCTIONING AUTISM

When investigating employment in autistic individuals, it becomes obvious that adulthood remains much underrepresented in autism research. With autism being a lifelong condition, most autistic individuals need support through lifetime, but services (e.g. health, education, employment) are lacking particularly for adulthood (Shattuck et al., 2012). Despite an immense upsurge in studies regarding autism in the first decade of this century (between 2000 and 2012, three times more studies ($n = 16\,741$) were published compared to the years between 1940 and 1999 ($n = 6054$) (Lai et al., 2014)), the main research attention has been (and still is) on childhood. Jang and colleagues (2014) analyzed the age of study participants in autism studies in between 1994-2004 and identified that only 20% of the research articles ($n = 2857$) included adult population (from 20 years onwards). Edwards and colleagues (2012) found that only 1.7% of the participants in intervention studies conducted in between 2009 and 2012 (number of articles = 146) were aged twenty years or older. Even though prevalence rates in adults are as high as in children (Brugha et al., 2011), research on autism in adulthood is much more limited. Based upon an estimated world population of 7.3 billion people at present, of which two-thirds are over nineteen years old (hence 4.9 billion adults) (United Nations, 2015), there are approximately 49 million autistic adults worldwide (based upon the prevalence estimates of 1%), of which approximately half have average or superior intellectual abilities. Within the autism spectrum, this sub-group of high-functioning autistic adults – many of whom did not receive their diagnosis before adulthood - has specific characteristics (e.g. social and communicative problems, but average (or above) levels of intelligence) and many services for disabled individuals do not meet their unique needs. One of the most important gaps to fill for this population is a more comprehensive understanding about factors that can improve their employment situation (Howlin et al., 2015). The extent of the gap is illustrated by Nicholas and colleagues (2015),

who identified in their review of literature only ten studies¹⁰ focusing on autism and vocational interventions, whereby only four focused specifically on high-functioning autistic adults. Furthermore, Walsh and colleagues (2014) also came to similar results, reviewing the existing autism literature regarding vocational studies and identifying 26 studies that they categorized as impact (N=3), predictor (N=6) and intervention (N=17) studies. In line with this, Howlin and colleagues (2015) summarized in their roundtable report that adult intervention studies are few in number and poor in quality and that support networks for autistic adults are sparse and of lower standards than for children. To the paucity of the existing employment literature in high-functioning autistic adults adds the difficulty of generalizing and comparing study results, which is caused by small research samples, a lack of standardized assessment measures and studies reporting results on study participants with mixed IQ. Considering that improving employment opportunities for high-functioning autistic individuals has been identified as one of the priorities for future research in the ASC population (Howlin et al., 2015), it is surprising that no representative large-scale studies regarding employment in this population exist to date. To my knowledge, the only studies using large data sets are those analyzing national datasets (e.g. in USA: National Longitudinal Transition (NLTS2) study or Rehabilitation Service Administration (RSA-911). However, those datasets only cover individuals who were involved in special education programs (NLTS2) or who are enrolled in a public rehabilitation program (RSA-911), which means that especially high-functioning adults (and especially those who receive their first diagnosis in adulthood) are likely to be under-represented. To my knowledge, studies with comparable national data sets do not exist in Germany. Numbers referring to (un)employment are thus mostly from small-scale studies that are not representative and hence cannot be generalized. Moreover, they often use different categorical systems, which draws attention to the next problem, namely a lack of comparability across studies.

There is a high variability in existing studies addressing employment regarding which categories (e.g. employed, sheltered employment, unemployed, freelance) are reported and how they are defined (Chen et al., 2014). To address the necessity of a consistent assessment of employment (including over time to measure trajectories), Taylor and Seltzer (2012) developed a vocational index aiming to reflect the full range of vocational

¹⁰ Nicholas and colleagues first identified 3974 articles on interventions in ASC, from which 501 studies (12.6%) included participants 18 years of age or older, of this 501 articles 10 studies were identified as evaluating vocation-related interventions.

and educational activities of autistic individuals. The index comprises eleven categories coded on a nine-point scale from most to least dependent. However, the application of this index seems limited to autistic adults with little chances of achieving full competitive employment. The index differentiates well between less able adults, but as the highest score (nine) is applied for individuals who work for more than ten hours a week independently, but no further differentiation is made for individuals who work more hours. Accordingly, the application in more able high-functioning autistic adults will not provide sensitive results, as a person who is full-time employed (i.e. >35 per week) would receive the same score as a person who is only employed for 10 hours per week. As the use of such an index is most warranted, it would be useful to enlarge the scale and allow for more precise differentiation for those individuals who have higher employment achievements. Furthermore, in my opinion, educational and occupational activities should be distinguished and freelance employment should be added as a category. In addition, including other variables such as working hours per week, salary or job-related satisfaction would further add to the value of such a measure.

Another important aspect of any study reporting employment is the level of IQ of the participants. Many studies include autistic individuals with mixed IQ in employment studies, which makes the interpretation of results very difficult. In my opinion, this practice is counter-intuitive, as one would not expect autistic individuals with mental disabilities and high-functioning autistic individuals to achieve comparable employment outcomes (as you would not expect non-autistic individuals with and without mental disabilities to achieve comparable employment outcomes). Chiang and colleagues (2013) found the odds of participation in employment to be almost six times larger for autistic individuals leaving high school without intellectual disability as opposed to with intellectual disability, holding other variables constant. The common practice of including autistic individuals with a large IQ range in the same analysis may rather reflect a shortage of interventions designed specifically for high-functioning autistic individuals, which leads them to participate in programs designed for individuals with intellectual disabilities in the first place. This lack of specific interventions reflects the fact that until relatively recently high-functioning autistic individuals were considered to be only a small sub-group in the autism spectrum (with prevalence estimates of autism generally being much lower (Fombonne, 2009)), while recent prevalence data shows that over half of the autistic individuals are high-functioning (Lai et al., 2014). As the employment opportunities and thus the specific support needs vary substantially for high-functioning autistic individuals compared to those autistic individuals

with intellectual disabilities, I strongly recommend reporting employment data for these sub-groups separately.

Another bias in this line of research is the focus on the transition phase from high school or post-secondary education into employment, while there is a lack of studies focusing on adults from mid-adulthood towards higher age. This disregards especially the sub-group of high-functioning autistic adults that Lai and Baron-Cohen (2015) call the “lost generation of adults with autism spectrum conditions”, referring to those individuals who receive their first autism diagnosis in (often mid-)adulthood, as well as individuals who experience unemployment later in life owing to various reasons.

4.3.2 RESEARCH AGENDA AND COMMUNITY-BASED PARTICIPATORY RESEARCH

There has been much controversy regarding the research agenda, thus encompassing which research aims should be prioritized in future research projects. For example, *Autism Speaks* - one of the largest charities worldwide devoted to autism - received strong criticism by advocates of the neurodiversity¹¹ movement for defining its primary goals as funding research into the causes, prevention, treatments and cure for autism (Walsh, 2013). Critics pointed out that *Autism Speaks* spend large parts of the funds raised in biomedical research, while much less is spent on research that would enable autistic individuals to live happy, healthy, secure and productive lives (Silberman, 2015). In line with the criticism of the neurodiversity movement, Silberman analyses in his article in the Los Angeles Times that “less than 2% of the studies funded by the National Institutes of Health in 2010 were devoted to improving the lives of adults on the spectrum.” The question concerning whether to fund research devoted on “avoiding” and “curing” autism rather than focusing on research projects that would improve the life of affected individuals raises profound ethical questions, such as which impact further genetic identification of risk factors for autism would have on

¹¹ The concept of neurodiversity implies that there are neurological differences among the human population and that being autistic is one of them. Jaarsma & Welin (2012) state that “[b]eing neurodiverse or neurotypical (“normal”) are just different ways of existing as humans” (p.21). They also argue that high-functioning autism should not be regarded as a disorder, “but rather as a condition with a particular vulnerability”, as autism can “also have desirable and enabling consequences, both to the individual and to society” (p.22). Baron-Cohen and colleagues proposed that autistic traits are continuously distributed in the population (Baron-Cohen, Wheelwright, Skinner, Martin, & Clubley, 2001) and that “autism-spectrum condition is an extreme of the normal variation of autistic traits” (Baron-Cohen et al., 2009, p.500) This concept is controversial: The idea, that everybody is *somehow on the spectrum* has been criticized to trivialize the negative impact the condition can have on people’s lives (Kenny et al., 2015). However, Baron-Cohen and colleagues argue that the threshold between ASC and the continuously distributed autistic traits in the general population is set at the level where “autistic traits are significantly interfering in daily life functioning”, which is determined by clinical judgement (Baron-Cohen et al., 2009, p.500).

prenatal diagnostics, for example. In her essay on ethics in autism research, Walsh (2013) discusses relevant aspects regarding these concerns. One possibility to overcome this mismatch between researchers' priorities and those of the autistic community is through community-based participatory research projects. The most prominent research partnership between academic members and autistic self-advocates is the Academic Autistic Spectrum Partnership in Research and Education (AASPIRE, www.aaspire.org/). AASPIRE is a community-academic partnership in which academic and community members serve as equal partners in every phase of a research project. The benefits of a collaboration between academic and autistic members (the categories may also overlap) can be various, such as the insight of autistic members concerning their condition, the development of research projects based upon the needs of the autistic community, attention towards the use of non-discriminatory language and checking for understandable instructions for autistic research participants. AASPIRE has conducted various research projects such as the assessment of healthcare experiences of autistic individuals (Nicolaidis et al., 2015). I myself have co-founded the autism research cooperation (AFK, <http://www.autismus-forschungs-koooperation.de/english>), which brings together adults on the autism spectrum and scientists. We worked on several research projects together including the assessment of knowledge in different occupational groups about autism (e.g. General Practitioners, Teacher) (Kirchner et al., 2010, 2011) and the relationship between flow and special interests (Blanke et al., 2012). While the experience of working in the autism-research cooperation has been a very positive one altogether, the research process in a large group of individuals (group meetings were often with more than ten individuals) – many of whom are without an academic research background - was often slow and discussions were very long, which somehow reduces the feasibility of applying such a research approach systematically (however, these issues would probably also apply to a group process of a heterogeneous group of neurotypical individuals). In addition, at the time there was no (paid) principal investigator, which meant that everyone's engagement was voluntary. Taken together, the communal work and discussion on our research projects profoundly raised my awareness regarding the research interests and needs of the autistic community.

In study 3 of this thesis, a reduced participatory research approach was applied. I was supported by a focus group of high-functioning autistic adults who provided feedback on the development of the questionnaire; for example, regarding the relevance of the items and the non-discriminatory languages. All research material was tested by members of the focus group and I believe that this feedback helped to improve the questionnaire by increasing its

understandability and clarity. In my opinion, it is highly desirable to include autistic individuals in the various stage of the research process and specifically conduct research studies that are relevant for the autistic community.

4.3.3 OPPORTUNITIES AND LIMITATIONS OF THE STRENGTH-FOCUSED RESEARCH APPROACH

Focusing on strengths in autistic individuals offers a new perspective and can complement the rather deficit-oriented clinical descriptions of autism towards a more comprehensive and balanced resource-oriented model of autism. Information regarding strengths in autistic individuals (e.g. character strengths or special interests) is relevant for a wide range of different groups, such as autistic individuals themselves, family members, care takers, teacher, employers, colleagues and friends. In general, this approach can help to interpret aspects of the character or certain behaviors under a new light. As a feedback towards autistic individuals, knowledge about one's strengths can increase self-esteem and help to put those strengths into practice. Teacher can work with existing strengths to build up motivation and rapport to work on other less developed aspects, while employers can assign tasks to the employee that match their skills and preferences. As outlined in study 4, the assessment of strengths is a crucial part of supported employment programs. While both approaches that we used -the assessment of skills in form of special interests or personality-related strengths in the form of character strengths - can be informative, the identification of such strengths is just one step towards successful employment. In study 3, we found evidence that many autistic individuals report social and perceptual factors impairing work performance. While the match of skills and job tasks might be the most obvious one, the match between sensory needs and the work environment (e.g. quiet surroundings) and the support with communicative challenges at the job are as important for the successful job integration of high-functioning autistic adults.

More generally, increasing the knowledge regarding strengths in autistic individuals can change the prevalent assumptions of autism in society towards a more balanced and realistic representation about the condition. Draaisma (2009) argued that movies often misrepresent autism, showing autistic individuals as either “a mentally handicapped [...] egghead reading geek magazines” or a “savant with mental powers” (p.1477). This is in line with Pat Walsh's (2013) observations, writing that the “cultural fascination with autism is fed by representations” of autistic characters in books or movies with savant abilities, which “has led many people to believe that people with autism generally possess similarly unusual

talents”. She points out that in reality, most autistic individuals “sit at points along the spectrum rather than at or near its extreme end” (p.1168). This misinterpretation of high-functioning autism also has negative consequences on high-functioning autistic individuals, as they can be intimidated by the expectations that society has about them towards having special skills.

This leads to the question concerning the point at which certain skills or characteristics are considered strengths. The strengths that receive the most attention through media coverage are those that are exceptional and hence in which the individual excels compared to a norm. Many have heard about the autistic artist Stephen Wiltshire, who drew the skyline of New York with an incredible density of detail after a twenty-minute helicopter flight over the city. Furthermore, calendrical calculation skills or other savant skills impress the public and are obviously outstanding. However, as outlined in the introduction when referring to savant skills, these exceptional skills are relatively rare.

In the studies included in this dissertation, we focus specifically on those strengths that are relevant to the person; hence, we are interested in those aspects that individuals themselves consider a strength in comparison to other skills or characteristics that one has. The difference between these two viewpoints (absolute strengths vs. relative strengths) is very crucial: only a limited number of (autistic) individuals have abilities where they “outstand” the norm, whereas all individuals have relative strengths, which makes this approach feasible for everyone and it was suggested to be especially valuable for vulnerable populations with a history of poor achievements (Park & Peterson, 2009). One example for looking at relative strengths is the concept of signature strengths, which we applied analyzing the character strengths assessed with the VIA-IS in study 1. Moreover, in the assessment of the special interests in study 3, we placed an emphasis on which interests the high-functioning autistic participants considered important independent of comparing themselves with others.

I want to add that the strength-focused research approach can contribute to a more comprehensive and balanced model of autism, although it should not be misinterpreted as trivializing the symptomatology and problems associated with an autism diagnosis. With focusing on strengths related to autism, I do not want to diminish the (negative) impact that autism can have on affected individuals and their families, but rather offer a complementary perspective of autism.

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6 APPENDIX

6.1 LIST OF ABBREVIATIONS

ADI-R	Autism Diagnostic Interview-Revised
ADOS	Autism Diagnostic Observation Schedule
AS	Asperger Syndrome
ASC	Autism Spectrum Condition
ASD	Autism Spectrum Disorder
CI	Confidence Interval
DSM	Diagnostic and Statistical Manual of Mental Disorders
HFA	High-Functioning Autism
SEP	Supported Employment Program
SWLS	Satisfaction with Life Scale
VIA-IS	Values in Action Inventory of Strengths

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6.4 LEBENSLAUF

[Der Lebenslauf ist in der Online-Version aus Gründen des Datenschutzes nicht enthalten.]

6.5 EIDESSTATTLICHE ERKLÄRUNG

Hiermit erkläre ich an Eides statt,

- dass ich die vorliegende Arbeit selbstständig und ohne unerlaubte Hilfe verfasst habe,
- dass ich mich nicht bereits anderwärts um einen Doktorgrad beworben habe und keinen Doktorgrad in dem Promotionsfach Psychologie besitze und
- dass ich die zugrunde liegende Promotionsordnung vom 02.12.2008 kenne.

Datum und Ort

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