

“It takes two”: facilitating social interactions in autism – non-autism dyads

1. Introduction and state-of-art

1.1. Social interactions: autism in the neurotypical world

Social communication (one’s ability to share experiences, thoughts, emotions, and perspectives with others) and interaction (reciprocal exchange of social communication between two or more individuals) are the core topics in any investigation related to the human condition, as we are profoundly social ¹. One of the defining features of autism spectrum condition* according to the Diagnostic and Statistical Manual for Mental Disorders (DSM-5) are “persistent deficits in social communication and social interaction across multiple contexts” ². Indeed, numerous studies report that autism is linked to atypical social behaviours: verbal communication, gesture production or comprehension, pointing, eye contact, interpretation of non-verbal cues and other social communication elements ³⁻⁵. These atypicalities contribute to difficulties in interacting with others, leading to anxiety about the interaction and its outcomes, frustration, low self-esteem, self-blame, and social isolation; all of which have vast adverse impact on mental health and economical perspectives ^{6,7}.

Autistic[†] persons habitually (feel the need to) go the extra mile to improve interactions with their “neurotypical[‡]” peers, which often has negative consequences for them. For example, in the effort to improve the interactions, many autistic persons use masking or camouflaging: conscious or subconscious suppression of natural autistic behaviours and employing compensatory behaviours resembling those used by neurotypicals, e.g., scripting conversations, hiding personal interests, and forcing eye contact, gestures, and facial expressions ⁸. Masking has been shown to provoke exhaustion or fatigue, mental-health issues (for example depression and anxiety), ‘autistic burnout’ (intense physical, mental, or emotional exhaustion as a result of navigating the predominantly neurotypical world), and suicidal ideation ^{9,10}. Thus, the “deficits in social communication and interaction” have vast negative consequences on the quality of life and health of autistic people.

However, it is crucial to note that difficulties in social communication and interactions are a function of one’s behaviour as well as the demands of the environment, which is predominantly non-autistic ¹¹. Thus, in the traditional *clinical model*, autistic individuals’ “deficits” in social communication and interactions are based on the failure to comply with the social rules governing the non-autistic environment. However, the *social model* of autism portrays it as a difference (not deficiency), which may constitute a disability in the specific context of the neurotypical world ¹². Indeed, self-advocating autistic adults and other autism stakeholders have been warning about the ableist (discriminatory against neurodivergent and disabled persons) nature of the clinical model of autism as a disorder and deficit, and have been working towards introducing a change in the narrative. According to this view, autism communication is not “deficient”, but different.

Indeed, if social interaction and social communication were impaired in autism, interaction between two or more autistic individuals should be the most affected. However, several studies (and numerous first-person accounts) have provided evidence that while interacting with neurotypical peers is laden with difficulties for autistic individuals, they experience comfortable and successful interactions with other persons of their *neurotype*, i.e., those sharing similar interpretations and responses to social cues and other socio-emotional or socio-cognitive traits ¹³. For example, it has been shown that information transfer is as successful in autistic-only as it is in non-autistic groups, but significantly less in mixed-neurotype (autistic and non-autistic) dyads ¹⁴. Also, self-reported and perceived by others rapport is higher in same-neurotype (including autistic) in contrast to mixed-neurotype dyads ¹⁵, and autistic (as well as neurotypical) individuals have greater interest in future

* The clinical term is ‘autism spectrum disorder’. However, ‘autism spectrum condition’ eases the heavily psychopathologic terminology and associations with illnesses or diseases, which are unwelcomed by many individuals with this diagnosis. This is in line with the idea of neurodiversity, which emphasises variability in the brain ‘wiring’ across people, promoting inclusiveness instead of labelling those with ‘diseases’ in contrast to those who are ‘healthy’. For this reason, I use ‘autism spectrum conditions’ or simply ‘autism’ throughout this proposal. At the same time, it should be noted that the word ‘disorder’ may be accurate in the context of pronounced symptoms and substantial need for support in life.

[†] There is an ongoing discussion about the identity-first (autistic person) and person-first (person with autism) terms. While preferences differ between individuals, most English-speaking autistic individuals prefer identity-first language. For this reason, I use identity-first language in this proposal.

[‡] The word „neurotypical” was coined by the autism community to name population not displaying autistic-like behaviours. In a broader view, it encompasses population without any neurodivergent or psychopathological traits (epilepsy, schizophrenia, anxiety, etc.). It is important to note that no person is entirely neurotypical, as individual neuronal and behavioural variation is significant even in typically developing persons. Nevertheless, this term is widely used by the autistic community to describe the non-autistic and (mainly) non-neurodivergent individuals. Following this convention, I use this term in this meaning.

interactions with persons of their own neurotype¹⁶. Although both neurotype observers share more negative first impressions of autistic individuals, autistic observers are more willing to interact with them in the future, suggesting a higher flexibility in terms of social expectations and their violation^{17,18}.

These observations are closely related to the double-empathy problem^{6,19}, which proposes that social interactions require a two-way empathy, i.e., the ability to understand and be aware of another person's emotions, feelings, thoughts, and perspectives. Because the social experiences and expectations of autistic and non-autistic persons are different, interpreting social cues in the other-neurotype partner is difficult. A lot of attention has been paid to the difficulties on the autistic side, often ascribing atypical social expressions to lack of interest or capability⁴. Yet, interaction is a resultant of all parts involved. In fact, several negatively biased contributions to non-successful mixed-neurotype interactions have been identified in non-autistic individuals. For example, they have been shown to underestimate autistic social ability⁶, overgeneralise attribution of blame for unsuccessful interaction to autistic partners²⁰, display reduced tendency to attribute one's own contribution to misunderstanding, and overestimate one's own helpfulness in the interaction²¹. Neurotypicals are also less accurate in inferring context based on behavioural reactions of autistic vs. non-autistic persons²². Thus, social interaction difficulties experienced by autistic individuals should be viewed as a function of differences in communication styles of all involved interaction partners.

1.2. Improving social interactions: status quo and next steps

Many interventions for autistic individuals focus on explicit understanding of the implicit social rules of the neurotypical world, where the “optimal outcome” is often the suppression the natural autism-like behaviours²³. In contrast, trainings and education programs for non-autistic individuals are designed to promote autism awareness and acceptance, typically without the element of one's own communication change²⁴. Because successful social interactions are crucial for life quality and health not only of autistic persons but also their families and the society as a whole, it is pivotal to identify ways in which autistic – non-autistic communication can be improved. Such multi-neurotype social interaction trainings should crucially entail shared responsibility for effective communication between interaction partners, instead of exerting the pressure predominantly on the autistics to conform to the neurotypical norm.

Encouragingly, although the first negative impressions of autistic partners can be built very early in an interaction²⁵, they can be alleviated in non-autistic (but not autistic) observers by the explicit knowledge of the diagnosis²⁶. However, it is unclear whether disclosure of the diagnosis status improves interaction due to increased sensitivity to communication differences and understanding, or due to assuming social impairments in the autistic partners and applying different standards in rating the impressions. Further, while non-autistic individuals rate less favourably autistic than non-autistic persons in interactions without knowing their diagnosis^{25,27}, it does not occur when reading a transcript of their speech with no audio-visual social cues²⁵. This suggests that the negative impressions seem to be particularly rooted in non-verbal communication and this may be linked to lower readability of the other-neurotype partners²⁸.

Hence, as an alternative to disclosing the diagnosis status, a simple yet powerful strategy to facilitate mixed-neurotype social interactions may be explicit knowledge about the partner's communication style including both verbal and non-verbal elements. The description of a communication style would include examples of behaviours and their interpretation from the point of view of the described person, e.g., “your partner may avoid eye contact as she finds it uncomfortable, but she listens with interest also when not looking at the other person” or “she often makes a pause before replying to a question to consider carefully what is being said”. Some elements of this strategy begin to find applications in real-life. For example, measures to reduce the double-empathy gap between autistic and non-autistic persons have been incorporated in several public programs in the UK, raising awareness about autism and targeting the social environment and situation rather than solely the autistic person, e.g., ATLASS training by Studio3, the Synergy program by AT-Autism, and the SPELL framework's best practices of the National Autistic Society⁶. However, empirical evidence for the optimal type of approach as well as effectiveness of such interventions is still scarce.

2. Objectives

The research proposed in this application aims to fill this gap by empirically testing the effect of providing explicit knowledge about the communication characteristics of the interaction partner on the subjective and objective success of this interaction. **To this aim, this project has three main objectives:**

- (1) **To propose a tool for the assessment of social communication characteristics.** For this, I will select and combine existing tools for verbal and non-verbal communication^{29–33} to integrate multiple aspects of social communication into one pipeline (e.g., eye contact, use of prosody, gestures, turn-taking, response

time, etc.). Its sensitivity will be assessed with an online pilot study based on expected differences between autistic and non-autistic populations and variance (**Work package 1 (WP1): social communication**).

- (2) **To develop a tool for quantifying successfulness of a social interaction.** I will design and test a naturalistic social interaction paradigm (a task-oriented interaction requiring transfer of knowledge and collaboration, with a task-irrelevant interaction space) and measurements of subjective and objective successfulness of this interaction. Measurements will include performance (compliance with the instructions, exchange of knowledge), social behaviour (eye contact, physical distance, gestures^{34–36}), and self-report (rapport, willingness to interact further, comfortableness). Then, the strongest indicators of interaction success (as perceived by the interaction partners and external observers) will be identified with the aim to simplify the tool for future uses outside of the lab (**WP2: interaction assessment**).
- (3) **To test the effect of providing explicit knowledge about communication style of the partner on social interaction.** The primary aim is to empirically test the prediction that explicit knowledge and understanding of the communication style of an interaction partner improves mixed-neurotype dyad interactions. For this, the tools developed in WP1 and WP2 will be combined in an experiment in which same- and mixed-neurotype dyads will interact with or without prior learning about each other's communication characteristics (**WP3: empirical testing**).

In a broader view, this project will be an important step towards more refined trainings of mixed-neurotype social interactions. Because of the multi-faceted and complex nature of social interactions and of autism, such refined training is a long-term research commitment extending beyond the scope and feasibility of this proposal. However, the project proposed here aims to develop the necessary tools for such endeavour (WP1 and WP2) and to provide a proof of concept of the effectiveness of this approach (WP3). In a broader perspective, **I view this project as the first step in my long-term plan aiming to create and lead independent research focusing on neuropsychology of neurodiverse social interactions.**

3. Methodology

3.1. WP1: Social communication

3.1.1. Rationale and objectives

Social communication (or broader: social competence, the ability to navigate the social world³⁷) spans verbal (e.g., prosody, speaking speed and response time) and non-verbal cues (e.g., eye contact, use of gestures to support speech, facial expressions, body language). The key differences between communication styles of autistic and non-autistic people seems to be non-verbal. For example, non-autistic observers show negative bias towards autistic individuals when watching videos of them speaking, but not when reading transcripts of that speech²⁵. Thus, although communication substance and naturally displayed emotions of autistic individuals may be perceived in an unbiased way by neurotypicals, the interaction may still be affected by more qualitative aspects of communication²⁵.

In autism research, tools addressing social communication typically involve reports by a close other (parent, teacher), which are prone to biases and contexts and include statements like “avoids eye contact” (e.g., the Social Responsiveness Scale-2³⁸, the Vineland Adaptive Behavior Scale³³). Promising alternatives are offered by self-reports (e.g., the Autism Spectrum Quotient²⁹) with elements like “when I talk on the phone, I’m not sure when it’s my turn to speak”, and by clinical assessments describing social behaviours (the Autism Diagnostic Observation Schedule³¹). Nevertheless, these tools are derived from the clinical model of autism and aim to grasp autistic symptomatology as features deviating from the neurotypical norm². A characterisation of communication characteristics on a group level may be apt for generalisable effects translating from one to many future interactions, but this approach reduces the sensitivity to individual characteristics. However, autism is considerably heterogeneous and it is discussed that the autism behavioural dimensions may extend beyond autism itself (see the discussion on autistic traits in the general population and the shift from categorical to dimensional conceptualisation of autism in¹¹). Thus, a more individualised assessment of social communication is needed in addition to the coarse group approach, in order to reach high impact and applicability of future trainings of social interactions in mixed-neurotype dyads (for which this project is a foundation). To extend the assessment of communication characteristics beyond symptom-based measures, I will include broader self-reported questionnaires, e.g., the Communication Style Inventory assessing six domain-level communicative behaviour styles measured with ratings of statements like “I address others in a very casual way” (informality), “I think carefully before I say something” (thoughtfulness), or “I am someone who can talk about trivial things” (substantiveness)³⁰. Finally, I will use laboratory-based, naturalistic observations of social communication behaviours in a face-to-face interaction with trained confederates (the Contextual Assessment of Social

Skills^{32,39}) or a simulated virtual interaction (the Simulated Interaction Task partner assessing voice, gaze, and facial expression⁴⁰).

With the use of these and/or similar tools, a broader and more detailed picture of social communication characteristics across and within neurotypes can be drawn. Hence, the goal of this work package is to create an **integrated tool for assessment of communication aspects (ITACA)** on both individual and group levels. This will include verbal skills³⁰, communication behaviour (what an individual shows to a partner^{32,39}), mentalising/Theory of Mind (the ability to attribute mental states to others; e.g., with the Strange Stories Task,⁴¹) and other social skills^{29,31}.

3.1.2. Work plan

First, I will conduct a thorough literature search for existing tools assessing verbal and non-verbal communication^{29,31,32,39,41,42} (**T(task)1.1**). Then, I will select the most promising tools and combine them into ITACA (**T1.2**). Further, ITACA will be piloted in an online study (e.g., on [Qualtrics](#); see section 5 for details on ethics clearance), in which data will be collected from a sample of neurotypical and autistic individuals (**T1.3**). For evaluation, I will look for predicted communication differences on the group level (autism vs. neurotypical) and expected variance within the groups. Hierarchical models and clustering (e.g., Principal Component Analysis) will be used to identify and select the strongest predictors of group differences (**T1.4**).

3.1.3. Milestones and deliverables

The milestones will be the creation of the preliminary (T1.2) and revised version of ITACA based on the data analysis from the online study (T1.4), which is also the main deliverable of this WP.

3.1.4. Hosts and collaborators

Tasks T1.1 and T1.2 will be carried out over 3 months at the Dartmouth Social Systems Lab of Prof. Dr. Thalia Wheatley at the Dartmouth College, Hanover, USA. Tasks T1.3 and T1.4 will take place at University College London, UK, under the supervision of Prof. Dr. Antonia Hamilton. See section 4 for details.

3.2. **WP2: Interaction assessment**

3.2.1. Rationale and objectives

To assess whether an intervention (in WP3: providing explicit knowledge about social communication characteristics of the interaction partner) is effective in facilitating social interactions, we need to be able to assess how successful an interaction is. The difficulty lies in the lack of “ground truth” for what constitutes a successful interaction. Previous research has approximated this concept with ratings of rapport³⁹ and willingness to interact again in the future²⁵. Structured self-reports of how an individual evaluates others (perceptions) and how an individual believes others evaluate them (metaperceptions) have also been used to assess inter-individual agreement in social impressions (e.g., the Perceptions and Metaperceptions Questionnaire⁴³). While undoubtedly valuable for accessing the subjective evaluations of social interactions, self-reports may be biased. For example, autistic people may be less accurate in metacognitive predictions of how they are judged by neurotypical interaction partners, overestimating positive impressions of themselves⁴⁴. At the same time, the opposite may be true for neurotypical participants⁴³. Thus, assessment of successfulness of social interactions should extend beyond self-reports and include also objective indexes of a successful interaction.

Objective measures of social interactions include performance and individual and inter-personal social behaviours. Performance can be assessed by providing task-relevant information to one participant and evaluating whether the other participant can repeat and/or apply it (transfer of knowledge)¹⁴. For quantification and evaluation of social behaviours in real-life interactions, several tools using standardised video-based assessments have been proposed, e.g., the Discussion Coding System³⁴, sequential analysis of group behaviours³⁵, and the Communication Analysis Tool³⁶. Other studies proposed video-based coding of custom indexes of social competence within an individual (e.g., proportion of time talking, frequency of seeking information) and between interaction partners (e.g., global eye contact, turn-taking, social ease) with composite scores based on rating scales administered by researchers⁴³. Similarly, the field of conversation analysis combines naturalistic observation and qualitative description to assess social behaviours in a real-life interaction, e.g., eye contact, physical distance, gestures, turn taking⁴⁵.

Moreover, there is a vivid need for naturalistic paradigms in the study of social interactions. It has been argued for a decade that well-controlled lab stimuli may be lacking ecological validity, resulting in findings that are not generalisable to real-life social situations⁴⁶. This applies to autism social cognition research. For example, recognition of naturally produced emotional facial expressions is similar for neurotypical observers in the faces of autistic and non-autistic people^{47,48}, but posed facial expression of autistic individuals are harder to

read by both groups⁴⁹. It is thus clear that the assessment of successfulness of social interaction must be achieved in a natural social interaction context. Hence, the objective of WP2 is to develop a **tool for assessment of social interactions (TASI)**, consisting of a naturalistic social interaction paradigm and subjective and objective measurements of successfulness of this interaction.

3.2.2. Work plan

First, I will propose a naturalistic social interaction paradigm incorporating a task-oriented interaction requiring transfer of knowledge and collaboration, as well as a task-irrelevant free interaction space (**T2.1**). In the initial conceptualisation of this paradigm, a dyad of (same- or mixed-neurotype) participants performs a drawing task with no time limit (for a similar design focusing on reciprocation, see⁵⁰). Prior to the interaction, each participant receives partial information about the goal of the task (e.g., to draw a house based on a model, or: with a specific colour). The interaction is recorded on video (with participants' consent). Participants are instructed to report when the task is achieved, after which they are informed that they need to wait 5 minutes for the experimenter (unstructured social interaction).

Next, I will identify a set of measurements of subjective and objective success of interaction (**T2.2**). Measurements will include performance (compliance with the instructions, exchange of knowledge, i.e., drawing a house similar to the model with correct colours), social behaviours (eye contact, physical distance, gestures, etc.^{34-36,43,43,45}), and participants' self-reported subjective ratings of the interaction⁴³ administered in a questionnaire after the interaction.

TASI, comprising the paradigm developed in T2.1 (**TASI task**) and the set of social interaction measurements identified in T2.2, will be then piloted with non-autistic participants (see section 5 for information on ethics clearance) and revised (**T2.3**). Participants will be invited to offer feedback about the task (e.g., how comfortable and natural it is, presence of sensory- or otherwise overwhelming elements) and research questions in the project. Based on this feedback and researcher's observations, revisions of TASI will be implemented.

Finally, the strongest indicators of successful interaction (as perceived by the interaction partners and external observers: experimenter and an additional person blind to the aims of the study and the diagnosis status of the participants) will be identified (**T2.4**). Composite scores will be calculated from the objective measures (performance and social behaviours) and participants' self-reports (as a mean inverted difference between ratings of the same item between participants, e.g., if one participant rates rapport at 9 and the other at 7 on a scale from 1 to 10, the rapport score is $10 - (9 - 7) = 8$, indicating high agreement). The total score will be a (weighted) sum of the composite scores (**TASI score**).

3.2.3. Milestones and deliverables

The main milestone will be the creation of TASI paradigm and the preliminary social interaction measurements (T2.2). The second milestone, as well as the main deliverable of this work package, will be the revised version of TASI after the pilot (T2.4).

3.2.4. Hosts and collaborators

This work package will be carried out at the [Social Cognition lab](#) at University College London, UK, under the supervision of Prof. Dr. Antonia Hamilton (see section 4 for details on the suitability of the hosts).

3.3. **WP3: Empirical testing**

3.3.1. Rationale and objectives

This work package will combine the work produced in WP1 and WP2 to empirically test whether providing explicit knowledge about the social communication characteristics of an interaction partner (as assessed with ITACA) facilitates social interaction (as assessed with TASI). In addition to testing this hypothesis, the goal of WP3 is to gain insights about the underlying factors in the facilitated same- compared to mixed-neurotype interactions. On the one hand, the reason for this may be due to similar communication styles in same-neurotype dyads. On the other hand, some extra-communication factors may impair the interactions of mixed-neurotype dyads, e.g., the learned self-consciousness of the autistic persons as the bearers of atypicalities in mixed dyads. Hence, to reduce initial biases, participants will not be informed about the diagnosis status of their interaction partner.

3.3.2. Work plan

While preparing for the implementation of ITACA and TASI, I will apply for ethics approval (see section 5 for details) and preregister the methods and hypotheses for the study, e.g., at the [Open Science Framework](#) (**T3.1**). The preparations will include translating the tools from English to German, preparing the lab space, and calculating the sample size (with GPower⁵¹ or R pwr package⁵², based on power = 0.8 and alpha = 0.5. Note that estimation of the smallest effect size of interest is dependent on the final measurements

in TASI (T2.4) and thus will be only possible at this stage of the project; however, a realistic estimation based on the literature is a sample of ca. 70 participants¹⁵)).

After obtaining the ethics clearance, the study will be conducted (**T3.2**). **Procedure:** autistic and non-autistic participants will be recruited via specialised outpatient clinics for autism and social interactions in Berlin (e.g., the [Charité Medical University](#) and the [Outpatient Clinic for Social Interaction](#)), online platforms, and social media. Age- and sex-matched dyads of adults with no co-occurring conditions (including intellectual disability; but see section 8.3 for future extensions of this work) will be invited. Each participant will be randomly assigned to a mixed- or same-neurotype (MN and SN, respectively) dyad. First, ITACA will be administered to all participants after which the dyads will perform the TASI task. The TASI score will be derived from participants' self-ratings and evaluations of the video recordings of the interactions. **Design:** The experimental manipulation will be a between-group factor: in the experimental condition, dyads of participants will gain explicit knowledge about the social communication characteristics of each other prior to the encounter by reading evaluations based on ITACA, e.g., “your partner enjoys talking about others more than themselves”, “they feel more comfortable avoiding eye contact”, “they sometimes make a pause before replying to a question to consider carefully what was said” (condition +). In the control condition, they will read factual, non-related to social communication statements about the partner, e.g., “your partner enjoys hikes in the mountains”, “they prefer tea over coffee”, “they were born in a small town and recently moved to Berlin” (condition –). **Hypotheses:** The main predictions in the study will be: (1) in the control condition, MN– dyads would have lower TASI score than SN– dyads (replicating previous research^{13,15}); (2) TASI scores for the MN+ dyads would be higher than for MN– dyads, indicating beneficial effect of explicit knowledge about communication differences on social interaction. **Analysis:** Hypotheses testing will be conducted using linear mixed models in R^{52,53} with TASI score as the dependent variable, and group (autistic, non-autistic), dyad (MN, SN), and condition (experimental: +, control: –) as independent variables.

After analysing the data, I will write a manuscript describing the study and its results for publishing (**T3.3**). Further, insights about TASI and ITACA gained during this study will be discussed with all collaborators and implemented in revisions. This will be shared with the research community as a published study protocol, e.g., at [bio-protocol](#) (**T3.4**).

3.3.3. Milestones and deliverables

The main milestones will be gaining the ethics approval (T3.1), completing data collection and analysis (T3.2), and drafts of publications (T3.3 and T3.4), which are also the main deliverables of this work package.

3.3.4. Hosts and collaborators

This work package will be realised at the Humboldt-Universität zu Berlin, with Prof. Dr. Isabel Dziobek. This host provides access to lab space, equipment (e.g., cameras), recruitment infrastructure, and existing participatory research programs (see more in section 4).

4. Supervision and suitability of the hosts

The first stage will be carried out over 3 months at the [Dartmouth Social Systems Lab](#) of **Prof. Dr. Thalia Wheatley** at the Dartmouth College, Hanover, USA. Prof. Wheatley and her lab are experts in social communication and interactions. It is especially fitting for the two tasks from WP1 which I plan to complete there, as the lab's ongoing research specializes in what makes conversations good or awkward and in neuro (hyper-scanning) and physiological cues in social communication, which would be an important next step in the refinement of ITACA (and should be planned in at the early stages for future applicability). Thus, I will be able to discuss this project in the broader view of social interactions in the general population and network with expert social cognition researchers at this Ivy League institution.

The second stage will take place over 9 months at the [Social Cognition lab](#) at University College London, UK, under the supervision of **Prof. Dr. Antonia Hamilton**, who is a leading autism and social cognition researcher. Her group has previously investigated social cognition in mixed-neurotype dyads⁵⁴. This stage would give me the exceptional opportunity to learn from Prof. Hamilton's expertise and network in the UK – one of the most prominent scientific environments for applied autism research in Europe. Finally, the project would benefit from the available research infrastructure at the University, including existing recruitment channels, and labs with equipment for observation studies (cameras, motion capture, etc.).

The last stage (6 months) will be realised in the [Clinical Psychology of Social Interaction lab](#) at Humboldt-Universität zu Berlin, Germany, led by **Prof. Dr. Isabel Dziobek**, who will be the main supervisor of this research. Crucially for this project, Prof. Dziobek's expertise in autism spans research, clinical, and societal angles, which offers a unique support for this work and development of my professional skills.

Moreover, the lab spaces at the University are already equipped in cameras (for video recording of TASI task) and autism-friendly elements (e.g., dimmed lights, noise-proofed rooms). Finally, thanks to Prof. Dziobek's leadership of the [Outpatient Clinic for Social Interaction](#) and the [Autism Research Cooperation](#), as well as membership in the [Berlin Circle for Participatory Research in Clinical Psychology and Psychiatry](#), this project can benefit from accessibility of autistic participants and collaborators.

5. Ethics information

5.1. Issues

This project includes human participants and processing of personal and sensitive data (autism diagnosis status, existence of co-occurring conditions). While autistic adults without intellectual disabilities targeted in this research are not considered vulnerable, appropriate safeguarding measures will be put in place to ensure ethical and comfortable participation. This includes a detail description of the study available prior to the participation, including lab spaces (size, presence of other people, ventilation, with photos), experimenter (photo, name, role), timings (order of activities with estimated times), and sensory stimulation (expected lighting, sounds, smells, etc.), following the [AFK's checklist](#) for autism-friendly research.

5.2. Compliance with principles and legislations

I plan to conduct three data collections in this project (T1.3, T2.3, T3.2). For this, I will apply for ethics approvals from the committees at the universities at which the collection will take place: University College London (combined application for T1.3 and T2.3; **E1**), and Humboldt-Universität zu Berlin (T3.2; **E2**). I will follow the EU ethical standards highlighting the importance of avoiding harm to the participants, transparent use of data, ensuring informed and voluntary consent, respecting the rights, interests, privacy, and sensitivity of the individuals involved in the research (including eliminating undue influence or coercion by including emphasis that the participation is voluntary and that no information about who did or did not participate will be shared with the organisations assisting with the recruitment, i.e., outpatient autism clinics).

5.3. Data

All data will be treated in accordance with the Personal Data Protection (EU Regulation n°2016/679 of the European Parliament and Council on Data Protection; GDPR), and the ethical guidelines of the university at which data collection takes place. The data used in this project will be anonymous (online study at T1.3) or pseudo-anonymous (a random numeric code assigned to participant's data; T2.3, T3.2). The identifiable data (video recordings in T2.3 and T3.2) will be kept confidential at all times and no transfer or sharing of these data will take place. In terms of data sharing, participants will be informed that their fully anonymised data will be stored in the [Open Science Foundation](#) repository or similar Europe-based repository, so that other researchers can use it for scientific purposes.

6. Risks and contingency plan

Risk of disruption. Social research always poses a risk to disrupt people's lives, for example, contributing with time in participatory research. I will ask in advance how much time interested individuals are willing to contribute and ensure throughout the project that they feel comfortable with their participation.

Risk of causing distress: Explicit consideration of one's social difficulties may entail reliving prior negative experiences. Hence, this project may cause distress to participants. While interacting with contributing autistic adults throughout the course of the project (study participants or research contributors), I will ensure autism-friendly environment and awareness that they can terminate their participation at any time. Further, the planned research activities do not include any foreseen stressors exceeding a social interaction resembling an every-day encounter.

Resource-costly recruitment: Recruitment of autistic participants is time- and money-wise costly. To facilitate this process, I plan to conduct the parts of the project requiring existing access to potential autistic participants in institutions with ready solutions (see section 4). Moreover, when possible, the pilot data will be gathered online (T1.3), or only with neurotypical participants (T2.3).

7. Budget estimations

I predict the following minimum budget requirements: participant reimbursement in T1.3, T2.3, T3.2 ($40 \times 5 + 25 \times 12 + 70 \times 30 = 2600$ EUR) and consultancy fees for autistic stakeholders (400 EUR). The minimum research budget will be provided by Prof. Dziobek (3000 EUR) and the additional bench fees required by University College London (~500 GDP) will be covered by Prof. Hamilton. Nevertheless, I will apply for additionally research funding from local providers (e.g., the Visiting Fellowship by the [British Academy](#), Support of Projects by [Fritz Thyssen Stiftung](#), or Research Grants by [DFG](#)).

8. Impact, benefits, dissemination, and future research and application

8.1. Impact and benefits

This project aims to generate knowledge about social communication and interaction between autistic and neurotypical individuals. The applicability of this research is far-reaching: it not only contributes to lives of autistic people and their families, but also has the potential to inform future clinical interventions, social initiatives, and policy making. Moreover, by understanding social interactions as bidirectional instead of coming from a one-sided point of view of the neurotypical majority, we contribute to the paradigm change towards the more inclusive, social model of autism⁵⁵. I always make sure that my research benefits those I work with. I am in contact with autism communities in the physical and digital space and follow their preferences (e.g., non-ableist and identity-first language). In my work, I share knowledge with autistic adults, autism specialists (e.g., [Autisme La Garriga](#), [Catedra Autisme Girona](#)), and other autism stakeholders (e.g., autism educators), as well as research community (e.g., at numerous conferences; please see my CV). I am also leading activities aiming to raise awareness about autism in the general population and to bring closer autism community and research (recently I won a [social impact grant](#) at Universitat Pompeu Fabra for a project with these goals).

8.2. Dissemination

The main scientific output of this project will be open access publications (T3.3 and T3.4) and presentations at scientific conferences (e.g., [WTAS](#) and [ESCAN](#)). The values of open and reproducible science will be present at all stages of this project. I aim to preregister the planned study (T3.2) and make materials, analysis code, protocols, and anonymised data (see ethics information in section 5) available (for similar practices in my research, please see [my website](#)). In terms of further return to the society, I will share a simple-words summary of the project and its findings with all the participants in the study (autistic and non-autistic) and the collaborating organisations and individuals.

8.3. Future research applications

The next step will be to test whether interactions benefit more from providing the explicit knowledge about the partner's communication characteristics to one neurotype (and if so, autistic or non-autistic?) or both, which would generate next research hypotheses and provide readily applicable knowledge about mixed-neurotype interactions. In the future I also plan to expand this project by including different age groups (children, adolescents, elderly) to investigate the developmental trajectory of the mixed-neurotype interactions. I also aim to modify ITACA and TASI to include minimally verbal participants and individuals with intellectual disabilities to address interactions in broader autism spectrum. In a wider perspective, TASI would benefit from addition of neuro- (brain synchrony) and physiological (heart rate, pupil size, salivary cortisol) indexes of inter-personal synchronisation. While I do not plan to include them in this project, TASI will be created with the perspective of including them in future replications and extensions (e.g., planning in limited movements allowing for wearable measuring devices). TASI will be flexible to include further manipulations, like obstacles mimicking real-world conditions (e.g., not seeing each other, participants speaking different languages, receiving conflicting instructions). Finally, both ITACA and TASI have the potential to be used in broader psychological research (e.g., gender differences in communication, other populations showing social interaction difficulties, like ADHD or anxiety), and other fields (screening in therapy, education, self-betterment, etc.).

9. Training opportunities and alignment with long-term career goals

I have a strong background and necessary skills to realise this project thanks to my training in Cognitive Science (BSc and MSc) and Psychology (PhD), research experience (four research projects including autistic participants; please see my CV for details), and social involvement in the field of autism (volunteering with autistic children ([Big Fat Smile, Australia](#)) and adults ([Autisme La Garriga, Spain](#)); social impact activities). I wish to continue my work and development of research and personal skills, and the DAAD PRIME Fellowship would be an exceptional opportunity for me to do so. First, I would deepen my understanding of social cognition in autistic and neurotypical populations, including the newest approaches in social interaction research (Dartmouth College and University College London). Further, I would gain hands-on experience and knowledge about participatory research from the leading institutes in the field (Humboldt-Universität zu Berlin). Also, while my previous research focused on neuro- and physiological markers of cognitive processes, the strong focus on behaviour in this project is the key to increase its impact and applicability. This programme would let me increase my expertise in this regard. Finally, **from the perspective of career development, I view this project as the first step in my long-term plan aiming at creating and leading independent research focusing on neuropsychology of neurodiverse social interactions.** This project would allow me to formulate a research plan for writing the DFG Individual Research Grant or ERC Starting Grant applications.