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ADHD and Emotion Regulation during Foreign Language Classes: A Causal Modelling Approach

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Abstract: The present study examines the impact of ADHD on emotion regulation in social situations (e.g. interactions with others), within the context of foreign language classes, based on a causal modelling approach. Utilizing Morton's causal tree model (2004), the research aims to investigate whether ADHD affects emotional responses to two specific types of social stimuli: interactions with lecturers and interactions with peers during foreign language classes. The research hypothesis suggests that individuals with ADHD will exhibit distinct patterns of emotion regulation in situations of potential, imagined, or actual rejection within these interactions, due to the frequent comorbidity of ADHD with Rejection Sensitivity Dysphoria (RSD).

Keywords: emotion regulation, Rejection Sensitive Dysphoria (RSD), Attention Deficit Hyperactivity Disorder (ADHD), Causal Modelling Approach, foreign language classes, special educational needs (SEN).

Introduction

Individuals affected by attention-deficit/hyperactivity disorder (ADHD) are significantly more susceptible to academic achievement difficulties and learning disabilities (LD) compared to neurotypical individuals. Research indicates that between 27% and 31% of students diagnosed with ADHD encounter various learning difficulties as well as a range of other challenges within classroom settings (DuPaul/Volpe 2009: 152). Due to the nature of the disorder, characterized by impulsivity, inattention, and hyperactivity, the presence of ADHD can lead to difficulties in social situations, including interactions with others.

Commonly observed behaviours that may negatively impact the social functioning of individuals with ADHD include speaking too quickly, interrupting others, difficulty finishing sentences, easily experiencing frustration and negative emotions, quick temper, loss of behavioural control, aggression, and others (Silverman et. al, 2015; Barkley/Fischer 2010; Zoromski et al. 2015). Furthermore, individuals with ADHD often exhibit low to moderate deficits in social cognition, affecting social understanding, interpretation of emotional reactions, and problem-solving (Bora/Pantelis 2016; Bunford/Evans/Langberg 2018; Sibley/Evans/Serpell 2009). Additionally, emotional impulsivity presents challenges in functioning, manifesting as anger outbursts, difficulties in emotion regulation, and low frustration tolerance.

Emotion regulation is a significant aspect of functioning in individuals with ADHD. Both children and adults with ADHD experience emotional lability, irritability, and dysregulation. However, studies have shown that these are even more common in adults

(34–70%) than in children with ADHD (25–45%). Consequently, regardless of other core symptoms, emotion regulation should be regarded as a crucial predictor of impaired social functioning when diagnosing the disorder in adults (Szamburska-Lewandowska[1]), which unfortunately is not currently reflected in the commonly used diagnostic criteria (e.g. according to International Statistical Classification of Diseases and Related Health Problems 10th Revision[2]).

1. Background to the study

1.1. Attention Deficit Hyperactivity Disorder

Attention Deficit Hyperactivity Disorder (ADHD) is recognized as one of the most prevalent neurodevelopmental disorders (American Psychiatric Association 2013) or specific learning difficulties (American Psychological Association 2022). It is considered a lifelong condition affecting approximately 2.5% of the adult population worldwide (Ginsberg et al. 2014). However, studies show that many individuals are still underdiagnosed and undertreated (Kooij et al. 2019) as ADHD symptoms are less obvious in adults (Biederman 2011), especially hyperactivity (Schwartz 2002; Quinn/Madhoo 2014). ADHD is characterized by a persistent pattern of three core symptoms: inattention, impulsiveness, and/or hyperactivity, describing three specific subtypes of ADHD: combined, predominantly inattentive, and predominantly hyperactive-impulsive.

A persistent pattern of inattention and/or hyperactivity-impulsivity is present before the age of 12 years and interferes with the everyday functioning of an individual in more than one setting (e.g., at home, school, or work). To be diagnosed with ADHD, a person must exhibit at least six symptoms of inattention and/or six symptoms of hyperactivity-impulsivity. For diagnostic purposes, two classifications are used: the criteria outlined in the 10th edition of the International Classification of Diseases and Related Health Problems (ICD-10) (World Health Organization 2019), which is a medical classification compiled by the World Health Organization, and the DSM-5 (Diagnostic and Statistical Manual of Mental Disorders; American Psychiatric Association 2013), which is the latest edition of the classification of mental disorders by the American Psychiatric Association.

[1] (URL: https://cbt.pl/poradnie/dysregulacja-emocjonalna-u-osob-doroslych-z-adhd-objawy-i-oddzialywania-terapeutyczne/) (Accessed: 25th June 2024).
[2] (URL: https://icd.who.int/browse10/2019/en) (Accessed: 25th June 2024).

	DSM-5	ICD-10
Name	ADHD	Hyperkinetic disorder
Onset	Some symptoms before age 12	Some symptoms before age 6
Symptom Criteria for children	ADHD combined: 6 of 9 symptoms of inattention and 6 of 9 symptoms of hyperactivity/impulsivity ADHD predominantly inattentive: 6 of 9 symptoms of inattention ADHD predominantly hyperactive/impulsive: 6 of 9 symptoms of hyperactivity/impulsivity	Must have a combination of impaired attention AND hyperactivity The only subtype is hyperkinetic conduct disorder for those who meet criteria for both disorders
Symptom Criteria for persons aged ≥ 17	ADHD combined: 5 of 9 symptoms of inattention and 5 of 9 symptoms of hyperactivity/impulsivity ADHD predominantly inattentive: 5 of 9 symptoms of inattention ADHD predominantly hyperactive/impulsive: 5 of 9 symptoms of hyperactivity/impulsivity	Must have a combination of impaired attention and hyperactivity
Settings	Several symptoms present in ≥ 2 settings	Full syndrome in ≥ 2 settings and observed by clinician
Duration	≥ 6 months	≥ 6 months
Impairment	Interference with social, academic, or occupational functioning; includes severity specifiers: mild, moderate, severe	Clearly significant distress or impairment in social, academic, or occupational functioning.

Fig. 1. Comparison of DSM-5 and ICD-10 diagnostic criteria for ADHD (Jummani/Hirsch/Hirsch 2019[3]).

ADHD is described as a disorder with highly heterogeneous manifestations that vary across the lifespan and have a multifactorial etiology (Luo et al. 2019). The diagnosis of ADHD in adults is considerably more challenging due to the lack of specific criteria and the high comorbidity with other disorders (Barkley 2015). Despite recent evidence suggesting that affective difficulties frequently accompany ADHD beyond mere comorbidity, the diagnosis remains strictly clinical and is based exclusively on the behavioural symptoms of inattention, impulsivity, and hyperactivity (Leffa/Caye/Rohde 2022). This is also reflected in the diagnostic criteria (DSM-5, ICD-10), which do not consider other symptoms such as low frustration tolerance, irritability, ease of negative emotional experience, and emotional lability (Beheshti/Chavanon/Christiansen 2020).

In addition to the core symptoms, emotional regulation plays a distinct role in the functional deficits experienced by individuals with ADHD. Several studies have shown that children, adolescents, and adults with ADHD are highly likely to suffer from emotion dysregulation (ED). Approximately 70% of adults with ADHD report ED or emotional lability (Skirrow/Asherson 2013). These findings indicate that ED is a fundamental aspect of the disorder or, at the very least, a significant characteristic in a subset of individuals with ADHD. Over two decades after Wender (Wender 1998) identified ED-like symptoms as part of the clinical presentation of adult ADHD, manuals of mental disorders still fail to recognize these symptoms as criteria for the condition.

[3] (URL: https://tcmhcc.utsystem.edu/wp-content/uploads/2021/03/ADHD-Comparison-Table.pdf) (Accessed: 26th June 2024).

1.2. Emotion regulation in ADHD

In recent years, emotion regulation (ER) has become a focus of interest in the study of the emotional difficulties observed in ADHD (Soler-Gutiérrez/Pérez-González/Mayas 2023). Accoroding to Beheshti, Chavanon and Christiansen (2020: 2), emotion regulation shall be defined as:

> all processes that unfold over time and are related to the different emotions people have, the intensity of emotions, and how emotions are experienced and expressed. The major function of ER is to shape emotional states to facilitate adaptive, goal-directed behavior in a certain situation.

Whereas according to Gross (1998, as cited in Soler-Gutiérrez/Pérez-González/Mayas 2023: 2–3):

> emotional self-regulation or ER can be defined as a complex process by which people modulate their emotions to direct their behavior towards goals using strategies (for example, cognitive change strategy of reappraisal and response modulation strategy of suppression, which start when there are overlearned responses that conflict with the desired goal.

The first symptoms of emotional dysregulation appear very early in childhood compared to children with typical neuropsychic development (Sjöwall/Thorell 2019). There is a body of research addressing the issue of childhood ADHD and its connections with emotion regulation (Bunford, S. W. Evans, F. Wymbs 2015; Christiansen et al. 2019; Tehrani-Doost et al. 2017). However, there are still few studies on the occurrence of this phenomenon in adults with ADHD. Moreover, the available studies indicate differences in aspects related to emotion regulation between individuals with and without ADHD. Some studies show that adults with ADHD more frequently use maladaptive emotion regulation strategies, such as emotion suppression, compared to control groups without ADHD (Materna et al. 2019), while other studies do not confirm this (Thorell/Tilling/Sjöwall 2020). The observed differences may depend on the emotional assessment tools used in various studies. One factor that may explain the contradictory results is the high comorbidity present in adults with ADHD, which complicates the independent assessment of emotion regulation aspects (Berking/Wupperman 2012). Therefore, further research is necessary to identify which aspects of emotion regulation are impaired in adults with ADHD, what factors influence the regulation mechanism itself, and which tools are most appropriate for assessment.

Meanwhile, the aim of this article is to conduct a study assessing emotion regulation in adults diagnosed with ADHD (ages 1925) in response to group work situations involving two types of stimuli: interactions with lecturers and interactions with peer groups, using a causal modelling approach. The study will not identify the neurobiological or cognitive causes of these reactions but will attempt to interpret the participants' behaviours in light of these stimuli.

2. Research methodology

2.1. Rationale and research hypothesis

The foundations of the study encompass the concept of causation, along with the importance of assessing cognition, as well as physiological and biological factors that are essential in any research concerning the conceptualization and modelling of behaviours. John Morton and Uta Frith (Morton/Frith 2004) introduced a model of mental structures in individuals with autism, aimed at facilitating diagnosis despite substantial differences in symptomatology. The causal modelling framework should be viewed as a tool to enhance the clarity of current knowledge, thereby increasing the likelihood of verifying or falsifying theories by creating frameworks for theorizing and empirical testing.

Morton critiques the prevalent practice of circular reasoning in the field, where behaviours are simultaneously viewed as symptoms and causes (Korell/Marino/Ferraro 2017). He advocates for a focus on identifying the true causes, which originate at the biological and cognitive levels, with environmental interactions occurring at both substrates.

> In the area of human development, most of the explicit scientific search is for direct relationships between biology and behaviour. I believe that this search will have only limited success so far as human beings are concerned. The reason for this is that there are cognitive factors that mediate between biology and much of behaviour (Morton 2004: 20).

Morton emphasizes that causal diagrams should be interpreted probabilistically, given that variability can exist at any level. These diagrams can be utilized computationally to predict and analyze problem behaviours. The model's advantages include its flexible application to various topics and its acceptance across different theoretical orientations. Additionally, the framework can be employed to understand both individual cases and entire disordered populations.

The research hypothesis, formulated based on the causal tree model (Morton 2004: 208–226), investigates the mechanism of whether the presence of ADHD influences responses to two types of stimuli and results in different or similar behaviours with respect to emotion regulation. The following research model is limited to one cause, i.e. the presence of ADHD, and two types of stimuli, namely relations: ADHD students-lecturers and ADHD students-peers.

The causal tree model, based on the research hypothesis, posits that the presence of ADHD translates into differences in response to two types of stimuli concerning emotion regulation. This implies that individuals with ADHD will exhibit analogous emotional reactions to given situations involving potential, imagined, or real rejection: 1. in interactions with the lecturer and 2. in relationships with colleagues in the study group. This can be visualized as follows (cf. Fig. 2):

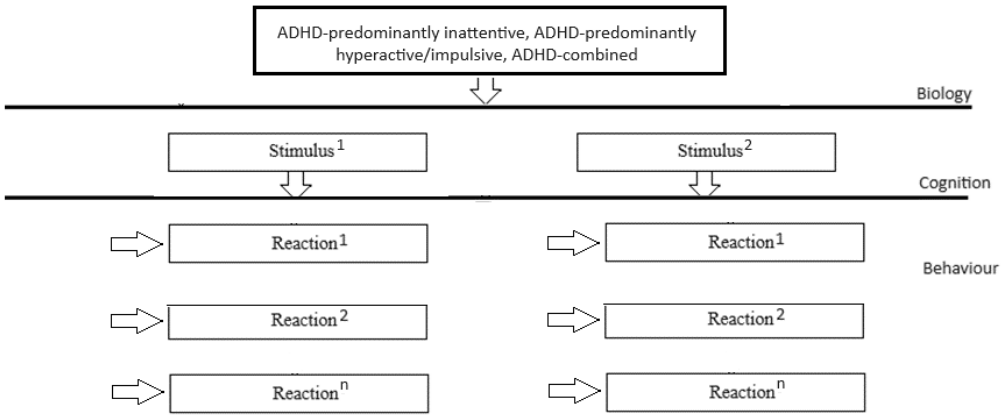

Fig.2. Causal Tree Model: Analogous Emotional Responses within a given type of stimulus for individuals with ADHD.

2.2 Participants

The participants of the study were students majoring in applied linguistics at both the undergraduate (5 students) and graduate (3 students) levels. All of them study two foreign languages, with English being either their first or second language. Additionally, the participants have been diagnosed with ADHD, exhibiting diverse presentations (predominantly inattentive, predominantly hyperactive/impulsive, and combined). Some also have comorbid disorders (e.g., dyslexia, dysgraphia, dysorthography, either diagnosed or suspected). The age of the participants ranges from 19 to 25 years, and they are all female.

Participants	Undergraduate / graduate studies	Age	Sex	ADHD presentation
Participant 1	undergraduate	21	female	predominantly inattentive
Participant 2	undergraduate	20	female	predominantly hyperactive/impulsive
Participant 3	undergraduate	20	female	combined
Participant 4	undergraduate	19	female	predominantly inattentive
Participant 5	undergraduate	22	female	predominantly inattentive
Participant 6	graduate	23	female	combined
Participant 7	graduate	23	female	predominantly inattentive
Participant 8	graduate	25	female	combined

Tab. 1. Participants of the study.

2.3 Data collection instruments

The starting point was a preliminary semi-structured interview, encompassing eight questions aimed at a preliminary assessment of whether the presence of ADHD influences emotion regulation in response to situations encountered during the process of foreign language learning. Participants were asked to evaluate, among other aspects, the emotions they experience while learning languages, to identify strategies for managing these emotions (especially negative ones), to determine the impact of emotions on their academic achievements, and to describe methods for coping with criticism and correction from both teachers and peers.

1. What emotions do you most often experience while learning foreign languages (e.g., frustration, anxiety, motivation)?
2. What situations in the context of learning foreign languages trigger strong emotional reactions in you?
3. Do you think your emotions affect your performance in learning foreign languages? How so?
4. How do you respond to criticism or corrections from teachers during language classes?
5. How do you respond to criticism or corrections from classmates during language classes?

The subsequent stage involved the completion of a questionnaire inspired by the Adult Rejection Sensitivity Questionnaire (ARSQ), a diagnostic test for rejection sensitivity, defined as a cognitive-affective processing disposition to anxiously expect rejection, shaped by cognitive-social learning history and triggered in situations where either rejection or acceptance is possible. The Adult Rejection Sensitivity Questionnaire (Berenson et al. 2009) is an adaptation of the RSQ (Downey/Feldman 1996) for assessing rejection sensitivity in adult research participants.

The questionnaire utilized in the present study was reformulated to highlight reactions in the form of specific emotions (emotional regulation) in response to two types of stimuli associated with typical situations encountered during foreign language learning. Half of the questionnaire addressed scenarios concerning ADHD student-lecturer relationships, while the other half pertained to ADHD student-peer relationships. Individuals affected by ADHD often exhibit emotional lability, experiencing intense emotions and abrupt mood swings in response to stimuli typical of situations associated with foreign language learning. Furthermore, these individuals tend to worry excessively, exaggerate problems, and display disproportionate and inappropriate reactions to specific situations, which was intended to be assessed through the questionnaire adapted to the context of language learning.

Adult Rejection Sensitivity Questionnaire adapted to the linguistic studies' perspective

1. I ask the lecturer for additional materials or individual consultations to better understand a difficult topic discussed in class.

very unconcerned	1	2	3	4	5	6	very concerned

I would expect that he/she would be willing to share materials and invite me for individual consultations.

very unlikely	1	2	3	4	5	6	very likely

2. After a heated discussion in class, I approach the lecturer to clarify my position and apologize for any misunderstandings.

very unconcerned	1	2	3	4	5	6	very concerned

I would expect that he/she would want to talk with me and understand my position.

very unlikely	1	2	3	4	5	6	very likely

3. I approach the lecturer after the lecture to ask for an extension on a project deadline due to unforeseen circumstances.

very unconcerned	1	2	3	4	5	6	very concerned

I would expect that he/she would be at least as eager to understand these circumstances and agree to reschedule the deadline.

very unlikely	1	2	3	4	5	6	very likely

4. I ask the lecturer to reassess my exam paper because I believe I deserve a higher grade.

very unconcerned	1	2	3	4	5	6	very concerned

I would expect that he/she would want to check my exam paper again.

very unlikely	1	2	3	4	5	6	very likely

5. After an unsuccessful presentation in front of the group, I ask the lecturer for feedback to learn what I can improve for the future.

very unconcerned	1	2	3	4	5	6	very concerned

I would expect that he/she would provide me with a feedback indicating points which I should rethink.

very unlikely	1	2	3	4	5	6	very likely

6. I approach a classmate after the session to apologize for a comment that might have offended them during our discussion.

very unconcerned	1	2	3	4	5	6	very concerned

I would expect that he/she would accept my apology and stop feeling offended.

very unlikely	1	2	3	4	5	6	very likely

7. During group work, I suggest a change in the working method to improve learning efficiency and ask the rest of the group for their opinion.

very unconcerned	1	2	3	4	5	6	very concerned

I would expect my classmates to agree on my suggestion.

very unlikely	1	2	3	4	5	6	very likely

8. I ask the project group for permission to change the presentation topic because the current topic is challenging for me.

very unconcerned	1	2	3	4	5	6	very concerned

I would expect the project group to accept my new presentation topic without criticizing my attitude.

very unlikely	1	2	3	4	5	6	very likely

9. I ask the group to change the debate topic because the current topic evokes strong emotions in me.

very unconcerned	1	2	3	4	5	6	very concerned

I would expect the group to understand my emotions and agree on my suggestion.

very unlikely	1	2	3	4	5	6	very likely

10. After an unsuccessful presentation in front of the group, I ask my colleagues for feedback and suggestions on what I can improve.

very unconcerned	1	2	3	4	5	6	very concerned

I would expect them to share their ideas about my presentation and provide me with a fair feedback.

very unlikely	1	2	3	4	5	6	very likely

2.4 Procedure

The data collection was conducted individually. The whole procedure lasted approximately 60 minutes per participant and consisted of four stages which are described below: 1. A written consent form for study participation was developed in compliance with the ethical guidelines established by the institution where the research was conducted. Participants were thoroughly informed about the study's procedures and the methods of data

collection. Additionally, they were assured that participation was entirely voluntary and anonymous and that they retained the right to withdraw from the study at any time without providing a reason.
2. A preliminary semi-structured interview was conducted in which participants were encouraged to share their thoughts on the significance of emotions in foreign language learning. The interview lasted an average of 30 minutes per person.
3. Participants were asked to independently complete the Adult Rejection Sensitivity Questionnaire adapted to the linguistic studies' perspective to verify their rejection sensitivity. The response time limit was not established, but it was estimated to take 20 minutes.
4. The immediate post-questionnaire interview (approximately 10 minutes) involved asking for comments on the questionnaire and any free-form conclusions.

2.5 Data analysis and results

The primary data phase involved the transcription of interviews—both preliminary and post-questionnaire—using the Descript software. The data collected in this manner will be utilized for further publications on the significance of emotion regulation (with a particular emphasis on the role of rejection sensitivity) in foreign language learning. In the present study, the interviews aimed to introduce the participants to the topic under analysis, thereby enabling them to accurately complete the specially designed questionnaire.

Subsequently, the questionnaires completed by the participants were analyzed. The results obtained were categorized into two groups, i.e. situations related to the relationships between students with ADHD and lecturers, and students with ADHD and their peers.

This study was designed as a pilot study to preliminarily verify the research hypothesis, specifically, to determine how the presence of ADHD affects emotion regulation in response to stimuli arising from typical situations associated with foreign language learning. Previous research has extensively explored the relationship between ADHD and emotion regulation in various educational contexts (e.g., Graziano/Garcia 2016; Seymour et al. 2012), identifying that individuals with ADHD often face greater challenges in regulating emotional responses to academic stressors and social interactions. For example, Graziano et al. (2007) emphasize that effective emotion regulation plays a crucial role in children's academic success, which can be particularly challenging for students with ADHD. Moreover, studies by Ryan et al. (2016) and Alacha et al. (2025) have highlighted that social functioning and learning effectiveness in college students with ADHD are significantly influenced by their ability to regulate emotions, as challenges in emotion regulation can mediate both academic and social difficulties. Thus, this study contributes to understanding ADHD-related emotional dysregulation in foreign language learning, building on insights from these foundational studies.

The initial research assumption visualized in the form of a model illustrating causal mechanisms was confirmed in practice as different stimuli indeed caused different emotional responses, i.e., different behaviours. The responses were entirely dependent on the type of stimulus, specifically, the student with ADHD-lecturer relationships versus the student with ADHD-peers relationships in terms of anxiety levels and expectations of a positive response.

A study conducted on a group of eight language students diagnosed with ADHD yielded the following results:

Stimulus 1: Situations of the student with ADHD-lecturer relationship

1. Request for additional materials or individual consultations:
   - Average level of anxiety: 4.4
   - Average expectation of a positive response: 3.7
2. Explanation of position after a heated discussion and apologies for misunderstandings:
   - Average level of anxiety: 4.8
   - Average expectation of a positive response: 4.0
3. Request for an extension on a project deadline due to unforeseen circumstances:
   - Average level of anxiety: 4.5
   - Average expectation of a positive response: 3.9
4. Request for re-evaluation of an exam paper:
   - Average level of anxiety: 5.1
   - Average expectation of a positive response: 3.3
5. Request for feedback after an unsuccessful presentation:
   - Average level of anxiety: 3.8
   - Average expectation of a positive response: 4.6

Stimulus 2: Situations of the student with ADHD-peer relationship

6. Apology to a peer for potential offense during a discussion:
   - Average level of anxiety: 3.1
   - Average expectation of a positive response: 4.8
7. Suggestion to change the method of group work:
   - Average level of anxiety: 3.4
   - Average expectation of a positive response: 4.4
8. Request to change the presentation topic due to difficulties:
   - Average level of anxiety: 3.5
   - Average expectation of a positive response: 4.2
9. Request to change the debate topic due to strong emotions:
   - Average level of anxiety: 3.3
   - Average expectation of a positive response: 4.3
10. Request for feedback after an unsuccessful presentation:
    - Average level of anxiety: 3.6
    - Average expectation of a positive response: 4.6

The survey results indicate several significant trends in the emotional behaviours of students with ADHD in response to the stimuli studied. Specifically, situations related to interactions with lecturers, particularly requests for re-evaluation of exam papers or clarification of misunderstandings, were associated with higher levels of anxiety and lower expectations of receiving a positive response from the lecturer. Lower emotional responses were associated with requests for additional materials, individual consultations, or additional feedback, which translated into relatively higher expectations of receiving a positive response.

In the context of peer relationships, students with ADHD reported significantly lower levels of emotions related to anxiety and stress and somewhat higher expectations of acceptance and support from their peers, particularly in situations requiring apologies and changes to debate or presentation topics.

Conclusions

The study confirms the hypothesis that the presence of ADHD influences students' responses to stimuli and emotional regulation in the context of foreign language learning. The results suggest that students with ADHD have moderate concerns regarding social interactions within peer groups, while simultaneously exhibiting high expectations for understanding and support from their peers. However, interactions with peers are also associated with certain concerns. Social stress stemming from the need for acceptance and the development of social skills poses a significant challenge, as individuals with ADHD often struggle to establish and maintain peer relationships. Furthermore, emotional regulation disorders are prevalent among those with ADHD, leading to difficulties in managing emotions. This often results in excessive emotional reactions during peer interactions, such as frustration, anger, or anxiety. Additionally, a heightened sensitivity to social rejection can intensify the stress experienced in group interaction situations.

On the other hand, interactions with lecturers are associated with greater concerns and a perceived lower likelihood of acceptance compared to peer interactions. This heightened anxiety may arise from several factors. Firstly, the stress related to being evaluated is significant, as interactions with lecturers often involve assessments and academic expectations. This can induce considerable stress in individuals with ADHD, who frequently experience anxiety regarding evaluation and criticism. Secondly, difficulties in maintaining focus and attention can exacerbate stress during direct engagement in conversation with a lecturer. Lastly, the fear of failure looms large, as students with ADHD may dread not meeting academic expectations, thereby intensifying feelings of anxiety and stress during these interactions.

In conclusion, both groups of stimuli can be considered significant sources of stress for individuals with ADHD, though the nature of these emotions differs. Interactions with lecturers may be more stressful due to academic evaluation and expectations, whereas interactions with peers may induce more social and emotional stress. The intensity and type of emotions may vary depending on the individual's characteristics with ADHD, including the presentation of ADHD and specific circumstances. A promising direction for future research would be to conduct a similar study with a group of students without diagnosed ADHD and compare the emotional responses to the same stimuli with those of students diagnosed with ADHD.

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