

Correlation between Autistic Traits and grade point average (GPA) among Medical Students: A Cross-Sectional Study

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Background/Introduction

Autistic traits are distributed continuously in the general population and are not confined to individuals with a formal autism diagnosis. The Autism-Spectrum Quotient (AQ) captures this continuum by scoring traits across five domains: social skill, communication, imagination, attention switching, and attention to detail (Baron-Cohen, Wheelwright, Skinner, Martin, & Clubley, 2001). Hoekstra, Bartels, Cath, and Boomsma (2008) later showed that four of these domains cluster into a single higher-order Social Interaction factor, while Attention to Detail forms a separate, largely independent factor ($r = 0.19$ between factors). This two-factor structure gives the instrument a robust basis for research relating specific trait dimensions, rather than only a single total score, to outcomes such as academic performance.

In general college populations, higher autistic trait scores predict a lower grade point average (GPA) and a higher probability of course failure, and these associations hold independent of whether a student carries a formal autism diagnosis; among trait subdomains, mentalizing deficits show the strongest link to poor academic outcomes (McLeod & Anderson, 2022). Within medicine specifically, medical students as a group score lower on the AQ than students in other STEM and non-STEM fields, yet among medical students, higher AQ scores predict a preference for technique-focused specialties over person-oriented ones (Turner, Aitken, & Richards, 2021). Giroux and Pelissier-Simard (2021) argue that traits associated with autism, such as attention to detail, deep focus on a narrow topic, and reduced reliance on interpersonal nuance, are often normalized and even valued in medical training and practice, and that high academic achievement has historically excused weaker social skills in this field.

Despite this body of work, no cross-sectional study to date has directly examined whether dimensionally measured autistic traits correlate with academic performance specifically within a medical student population, and almost none of the existing literature looks outside North America and Europe. A study conducted among medical students in Egypt and the wider Arab region would address both gaps: it would test whether the general-population relationship between autistic traits and GPA replicates in a population selected for academic achievement, and it would extend this line of research to a setting where it has not yet been examined.

This study will use the full 50-item AQ (AQ-50), administered in the official Arabic translation obtained from the Cambridge Autism Research Centre (attributed to Baron-Cohen et al., 2001), rather than the shorter AQ-28. The AQ-28 has recently been validated in Arabic-speaking adults (Fekih-Romdhane et al., 2025), but the AQ-28 and AQ-50 are distinct instruments with different item sets and factor structures; validation evidence for one does not transfer to the other. The Cambridge translation confirms the Arabic wording of the 50 items themselves; it does not extend to the Social Interaction and Attention to Detail factor structure, which is a separate scoring framework derived by Hoekstra, Bartels, Cath, and Boomsma (2008) from a Dutch population and has not been tested in any Arabic-speaking sample. Because no independently published psychometric validation yet exists for this Arabic AQ-50 translation, or for the Hoekstra factor structure in Arabic, this study will report the internal consistency (Cronbach's alpha and item-rest correlations) of the Total, Social Interaction, and Attention to Detail scores within its own sample as reliability evidence; findings for the Social Interaction and Attention to Detail factor scores will be treated as exploratory, since reliability evidence does not by itself establish that the underlying two-factor structure holds in this population. No preliminary data have been collected for this study.

Research Question

Is there a correlation between autistic traits and academic performance, measured as grade point average (GPA), among medical students?

Primary and Secondary Aims

Primary aim: To determine whether the Total AQ-50 score correlates with GPA among medical students.

Secondary aim 1 (exploratory): To determine whether the Social Interaction factor score correlates with GPA.

Secondary aim 2 (exploratory): To determine whether the Attention to Detail factor score correlates with GPA.

Secondary aim 3: To estimate the internal consistency (Cronbach's alpha and item-rest correlations) of the Arabic AQ-50 translation, for the Total score and each factor score, in this sample.

Secondary aim 4 (exploratory): To compare AQ-50 scores (Total, Social Interaction, and Attention to Detail) between Egyptian and international medical students, given that these groups are admitted through different selection processes.

Hypothesis 1 (primary aim): The Total AQ-50 score will show a statistically significant negative correlation with GPA, consistent with findings in general college populations (McLeod & Anderson, 2022).

Hypothesis 2 (secondary aim 1, exploratory): The Social Interaction factor score will show a negative correlation with GPA, consistent with the pattern predicted for the Total score. Because the Social Interaction / Attention to Detail factor structure (Hoekstra et al., 2008) has not been validated in Arabic, this hypothesis is exploratory, and any finding should be interpreted as hypothesis-generating rather than confirmatory.

Hypothesis 3 (secondary aim 2, exploratory): The Attention to Detail factor score will show a weaker, absent, or possibly positive correlation with GPA, since this factor behaves largely independently of the Social Interaction factor (Hoekstra et al., 2008) and detail-oriented traits may be neutral or favorable for academic performance in medicine (Giroux & Pelissier-Simard, 2021). As with Hypothesis 2, this hypothesis rests on a factor structure not yet validated in Arabic, so it is treated as exploratory and non-directional, and any finding should be interpreted as hypothesis-generating rather than confirmatory.

Hypothesis 4 (secondary aim 4, exploratory): AQ-50 scores (Total, Social Interaction, and Attention to Detail) will differ between Egyptian and international students. No specific direction is predicted, since there is no existing literature on how differing admission/selection pathways relate to autistic trait scores; this comparison is exploratory.

Outcome Definitions/Data Points Collected

The variables collected and their definitions are listed below.

Variable	Definition / Measurement
Total AQ-50 score	Sum of all 50 items of the Arabic AQ-50 (official Cambridge Autism Research Centre (ARC) translation of Baron-Cohen et al., 2001), after reverse-scoring the 24 reverse-keyed items; range 0 to 50, with a higher score indicating more autistic traits.
Social Interaction factor score	Sum of the 40 items loading on the Social Interaction factor (social skill, communication, imagination, and attention switching), per the Hoekstra et al. (2008) two-factor model.
Attention to Detail factor score	Sum of the 10 items loading on the Attention to Detail factor, per the Hoekstra et al. (2008) two-factor model.
GPA	Self-reported cumulative GPA on the participant's institutional grading scale.
Academic year	Current year of medical study, self-reported (categorical).
Age and sex	Self-reported demographic variables.
Nationality / student category	Self-reported, categorical: Egyptian or International (non-Egyptian/expatriate), reflecting the university's separate admission and selection pathways for these two groups.

Study Design

This is a cross-sectional, analytic survey study. It is observational: no intervention is applied, and the study assesses the correlation between two variables measured at a single time point, autistic trait scores and GPA, using a self-administered online questionnaire.

This study is single-center, conducted at the Faculty of Medicine, Alexandria University.

Target Population

The target population is currently enrolled medical students at the Faculty of Medicine, Alexandria University, across all years of the undergraduate medical program.

Inclusion and Exclusion Criteria

Inclusion criteria: currently enrolled as a medical student at Alexandria University; able to read Arabic; has completed at least one full academic semester and therefore has a recorded GPA; provides informed consent.

Exclusion criteria: declines informed consent; completes fewer than 95% of the survey items, consistent with the missing-data threshold recommended for self-administered surveys.

Sampling Method and Recruitment Process

Potential participants will be identified through official student email lists and university-affiliated class or social media groups at Alexandria University. A single online survey link (for example, a Google Forms link) will be distributed containing an information sheet, a consent and eligibility gate, the Arabic AQ-50, the demographic and covariate items, and a self-reported GPA item.

Because participation is self-selected through an online link rather than drawn from a complete sampling frame with random selection, this is a convenience (non-probability) sample; this limitation is acknowledged in the Study Limitations section. Research assistants will distribute the survey link and will not be able to identify who did or did not respond, to reduce the risk of perceived coercion given the student-to-student recruitment relationship. Eligibility will be screened through required survey logic at the start of the questionnaire, so that only respondents who confirm they meet the inclusion criteria and provide consent can proceed to the AQ-50 items. Because recruitment is anonymous and online, individual non-responders will not be tracked, which limits the ability to formally assess non-response (selection) bias; this is also noted under Study Limitations.

Study Retention and Withdrawal

This is a single time-point cross-sectional survey rather than a longitudinal design, so there is no follow-up period and no loss to follow-up to track. A participant may withdraw at any point before submitting the survey simply by closing the browser window, and no partial responses will be saved or analyzed. The consent and information sheet will state clearly that, because responses are collected anonymously, a participant cannot withdraw specific data after submission, since the research team will have no way to identify which submitted response belongs to which participant.

Study Procedures

Eligible participants who provide informed consent will complete a single online questionnaire, estimated to take ten to fifteen minutes, consisting of: a brief demographic section (age, sex, academic year, and nationality); the Arabic AQ-50 (official Cambridge Autism Research Centre (ARC) translation of Baron-Cohen et al., 2001), scored under the Hoekstra et al. (2008) two-factor model after reverse-scoring the 24 reverse-keyed items; and self-reported cumulative GPA.

Because no independently published psychometric validation exists for this Arabic AQ-50 translation, the study team will calculate and report Cronbach's alpha and item-rest correlations for the Total, Social Interaction, and Attention to Detail scores within this sample as internal-consistency evidence. This reliability evidence does not by itself confirm that the Social Interaction and Attention to Detail factor structure (Hoekstra et al., 2008) holds in this population; results for these two factor scores will accordingly be reported as exploratory.

Open item: the exact online survey platform still needs to be specified here. The survey will remain open until the required sample size is reached, at which point it will be closed to further responses.

The survey will be administered entirely online and can be completed on any personal device, so no in-person visit is required. The survey platform will be configured to accept only one response per participant (for

example, through response-limiting settings or a one-time access link) to reduce the risk of duplicate submissions, given the anonymous, self-selected recruitment approach. Research assistants will receive brief training on the study protocol, the consent process, and confidentiality procedures before recruitment begins, and will be responsible only for distributing the survey link. Responses will be entered directly into the survey platform's database, removing the need for manual transcription and the error that step introduces. The exported dataset will be stored as a password-protected file accessible only to the principal investigator and co-investigator.

Sample Size Justification

Sample size was calculated using the same method as the MedCalc correlation coefficient sample size calculator, with a Type I error (alpha) of 0.05, a Type II error (beta) of 0.10 (90% power), and a minimum correlation coefficient (r) of 0.15 considered meaningful to detect. This yielded a minimum required sample size of 463 participants. Because Hypothesis 3 anticipates a correlation for the Attention to Detail factor score that could be smaller still (or near zero, or positive), some residual risk of being underpowered for that specific comparison remains; findings for Secondary Aim 2 should be interpreted with this in mind, consistent with its exploratory framing.

Feasibility, Accrual, and Duration of Accrual

To be completed once enrollment figures are confirmed. As a working structure: state how many medical students are enrolled at Alexandria University, the response rate the team expects for an online survey, and the proportion of responses likely to be excluded for incomplete data. The survey will remain open until the required sample size of 463 is reached, at which point it will close to further responses; from the figures above, estimate the number of weeks this is expected to take.

Study Limitations

This study has several limitations. First, the cross-sectional design allows only correlational, not causal, conclusions about the relationship between autistic traits and GPA. Second, GPA is entirely self-reported and will not be verified against official university records, alongside the self-reported AQ-50, which introduces the possibility of recall or social-desirability bias, particularly given the sensitivity of autism-related self-disclosure. Third, the Arabic translation of the AQ-50 used in this study has not been independently psychometrically validated in a published study; the team will report internal consistency (Cronbach's alpha and item-rest correlations) from its own sample as partial reliability evidence. This gap is compounded for the Social Interaction and Attention to Detail factor scores, which additionally depend on the Hoekstra et al. (2008) two-factor structure derived from a Dutch sample; confirmatory validation of this factor structure in Arabic is beyond the scope and sample size of this study, so findings for these two factor scores are reported as exploratory rather than confirmatory. Fourth, convenience sampling through self-selected online participation may introduce selection bias, since students with stronger or weaker academic standing, or differing comfort disclosing autistic traits, may be more or less likely to respond, and anonymous collection prevents the team from characterizing non-responders. Fifth, findings from medical students at a single institution in one region may not generalize to medical students elsewhere or to non-medical student populations. Finally, this study does not measure study habits, sleep, or anxiety/depressive symptoms; academic year is the only covariate examined, so residual confounding from these and other unmeasured variables cannot be excluded.

Data Analysis

Descriptive statistics (means and standard deviations, or medians and interquartile ranges where distributions are skewed) will summarize participant demographics, the Total AQ-50 score, the Social Interaction and Attention to Detail factor scores, and GPA. Internal consistency of the Arabic AQ-50 will be assessed with Cronbach's alpha and item-rest (corrected item-total) correlations for the Total score and each factor score. Because eligible respondents must meet a 95% survey-completion threshold before inclusion, analyses will be conducted on this completed dataset, without additional missing-data procedures.

For the primary aim, the correlation between the Total AQ-50 score and GPA will be tested with Pearson's correlation coefficient if both variables are approximately normally distributed, or with Spearman's rank correlation otherwise; normality will be assessed with the Shapiro-Wilk test and visual inspection of histograms and Q-Q plots. The same approach will be applied separately to the Social Interaction factor score and the Attention to Detail factor score against GPA for the secondary aims.

As an additional exploratory analysis, the association between academic year and each AQ-50 score (Total, Social Interaction, and Attention to Detail) and GPA will be examined across academic-year groups using one-way ANOVA, or the Kruskal-Wallis test if the assumptions for ANOVA are not met, to explore whether these variables differ by year of study.

The Total AQ-50, Social Interaction, and Attention to Detail scores will be compared between Egyptian and international students using an independent-samples t-test if score distributions are approximately normal, or the Mann-Whitney U test otherwise.

Multiple linear regression will then be used to test whether each factor score predicts GPA independent of the other factor and of academic year (entered as a categorical variable using dummy coding). A two-sided alpha of 0.05 will define statistical significance. Because three primary correlations are tested (Total AQ-50, Social Interaction, and Attention to Detail, each against GPA), a Bonferroni-corrected threshold of approximately 0.017 will also be reported as a sensitivity check against inflated Type I error from multiple comparisons. This corrected threshold applies only to those three correlations; the regression results and the reliability estimates (Cronbach's alpha, item-rest correlations) are reported separately and are not held to this stricter threshold.

jamovi (a free, open-source statistical software package) will be used for all statistical analyses described in this protocol.

Administrative Organization, Roles and Responsibilities

The principal investigator, Motaz Mazen Al-Qawasma (Alexandria University), holds overall responsibility for study design, protocol development, ethics submission, and oversight across all workstreams. Co-investigator Mohammad Kamel Assi (Alexandria University) shares responsibility for recruitment, data collection, and analysis workstreams. A faculty supervisor has not yet been assigned; their role and responsibilities will be added once confirmed.

The study coordinator and research assistant roles, and the faculty supervisor, have not yet been assigned; confirm final personnel and add them here.

No external laboratories, call centers, or data-management centers outside the study team are involved, since all data collection occurs through a single self-administered online survey.

Use of Study Results

The results of this study are intended for submission as a manuscript to a peer-reviewed journal in medical education, psychiatry, or psychology, and may also be presented at a relevant academic conference. Findings may inform future, larger-scale, or longitudinal research on autistic traits and academic performance among medical trainees, and may contribute to discussions of student support within medical education. This study does not involve an intervention and, at this stage, is not intended to inform clinical practice or to seek grant funding.

Study Budget

This study involves no procedures outside standard of care and no cost to participants; data collection occurs through a free or low-cost online survey platform. No reserved fund or external budget has been allocated for this study.

The only anticipated cost is printing of survey papers, covered informally by the study team as needed; no other expenses (such as a survey-platform subscription fee, statistical software access, or participant incentives) are anticipated. Personnel time is contributed by the study team without additional compensation.

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Appendices

The following will be appended once finalized: the Arabic AQ-50 questionnaire (official Cambridge Autism Research Centre (ARC) translation); the informed consent and information sheet; the full online survey instrument, including the demographic and covariate items; and the item-by-item AQ-50 scoring key mapped to the Arabic PDF's item numbering.