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PSYCHOSOCIAL PREDICTORS OF AI CHATBOT RISK AMONG SWISS APPRENTICES

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ABSTRACT

AI chatbots such as ChatGPT, Copilot, and Gemini are becoming increasingly embedded in the everyday, educational, and professional lives of adolescents and young adults. While prior research has highlighted both the benefits of chatbot use and concerns about excessive or problematic engagement, less is known about which psychosocial factors are associated with elevated risk among apprentices in vocational education. Addressing this gap, the present study examines whether loneliness, social anxiety, and privacy concerns predict membership in a risk group for problematic AI chatbot use among Swiss apprentices aged 15 to 19. The study draws on a quantitative online survey conducted at vocational schools in Switzerland. The survey captures psychosocial indicators, AI chatbot usage patterns, and indicators of problematic use, enabling an empirical assessment of whether these variables differentiate adolescents with higher-risk usage profiles from their peers. By focusing on apprentices, the study extends emerging research on problematic AI use to a population that is highly relevant for both education and workforce preparation, yet still underrepresented in the literature. The article contributes to current debates on adolescent AI use by linking psychosocial vulnerability to risk-related patterns of chatbot engagement in a vocational education context. It thereby provides a foundation for identifying potentially vulnerable user groups and for developing evidence-based prevention, digital literacy, and educational support strategies for the responsible use of AI chatbots.

KEYWORDS

AI Chatbots, Swiss Apprentices, Vocational Education, Psychosocial Predictors, Privacy Concerns

1. INTRODUCTION

AI chatbots such as ChatGPT, Copilot, and Gemini have moved rapidly from novel applications to everyday tools in the lives of adolescents and young adults. In Switzerland, media-use research shows that digital technologies are deeply embedded in young people's everyday communication, learning, and leisure practices (Süss et al., 2024; The JAMES Study, 2024). At the same time, studies on student populations indicate that chatbot use is no longer limited

to experimentation: it is increasingly integrated into information seeking, explanation of difficult content, text production, and problem solving (Stöhr et al., 2024; Labadze et al., 2023; McGrath et al., 2025). For apprentices, who move daily between school, workplace, and private life, AI chatbots may therefore become a particularly attractive technology because they promise immediate support across several domains at once.

1.1 AI Chatbots in Apprentices' Everyday and Educational Lives

This development is especially relevant for apprentices because they occupy a distinctive life phase at the intersection of adolescence, education, and early employment. Developmental research suggests that identity formation, peer relations, and social positioning remain highly salient during this period (Ragelienė, 2016; Avci et al., 2025). At the same time, vocational education places young people in demanding hybrid environments that require them to learn, perform, and communicate in both school-based and workplace settings. In such contexts, AI chatbots may offer clear benefits, including fast explanations, drafting support, and low-threshold access to information. Yet recent discussions also point to possible risks, such as uncritical reliance on generated content, the substitution of human interaction with machine-mediated exchange, and the disclosure of personal or sensitive information to opaque systems (Generative AI, 2025; King et al., 2025; Leschanowsky et al., 2024). The question is therefore not only whether apprentices use AI chatbots, but also under which psychological conditions their use may become more vulnerable, avoidant, or potentially problematic.

Although research on AI chatbots has expanded rapidly, important blind spots remain. Much of the recent literature focuses on higher education, general student samples, or broad adoption patterns and therefore provides only limited insight into vocationally trained adolescents (Okonkwo & Ade-Ibijola, 2021; Wollny et al., 2021; Schei et al., 2024; Stöhr et al., 2024). Another strand of research examines problematic conversational-AI use and suggests that loneliness, social anxiety, rumination, and parasocial tendencies may increase emotionally compensatory engagement with such systems (Hu et al., 2023; Herbener & Damholdt, 2025; Peng et al., 2025; Latikka et al., 2025). However, these findings do not automatically transfer to apprentices, whose chatbot use may be shaped as much by educational and occupational demands as by psychosocial vulnerability. In addition, privacy concerns occupy an ambiguous position in the literature: they may discourage intensive use in some cases, but they may also coexist with continued engagement when users perceive strong practical benefits (Menon & Shilpa, 2023; Leschanowsky et al., 2024).

1.2 Contribution of the Present Study

Against this background, the present study investigates whether loneliness, social anxiety, and privacy concerns predict membership in a risk group for problematic AI chatbot use among Swiss apprentices aged 15 to 19. This focus contributes to the literature in three ways. First, it extends current research from predominantly university-based samples to vocational education, a context in which AI systems are likely to be used for both learning and work-related tasks. Second, it links general adoption research with emerging evidence on psychosocial vulnerability by testing whether theoretically relevant dispositions differentiate apprentices with higher-risk usage profiles from their peers. Third, it provides an empirical basis for prevention and educational support by identifying factors that may help schools and training institutions

recognize potentially vulnerable user groups at an early stage. The following section reviews the literature in greater detail, after which the research objectives, methodological procedure, and results of the study are presented.

2. RELATED WORK

Research on AI chatbot use among adolescents and students has expanded rapidly since the public release of large language model systems, yet the field still combines several partially separate conversations: one on psychosocial vulnerability and compensatory use, one on privacy and disclosure, and one on educational utility and technology adoption. This fragmentation matters for the present study because the interpretation of "risk" depends strongly on whether chatbots are approached as social companions, mental-health tools, or task-oriented learning aids. A review that stays close to these strands is therefore necessary before testing whether loneliness, social anxiety, and privacy concerns distinguish risk-group membership among Swiss apprentices.

Educational literature provides an important baseline because it shows that a substantial share of chatbot interaction is pragmatic rather than emotionally compensatory. In one of the earlier systematic overviews, Wollny et al. (2021) reviewed 74 publications on chatbots in education and concluded that these systems were already being used across multiple domains, especially for information provision, tutoring, mentoring, and support for personalized learning. Their review is useful for the present study because it frames chatbots not primarily as social substitutes but as scalable communication and learning tools. Okonkwo and Ade-Ibijola (2021), reviewing 53 studies, similarly found that educational chatbots were associated with quick access to information, personalized support, and administrative efficiency, while also identifying challenges related to quality, usability, and implementation. Taken together, these reviews suggest that frequent chatbot use in student populations may reflect functional academic routines rather than psychosocial strain alone.

More recent reviews reinforce this point while also showing how quickly the field has diversified after the rise of generative AI. Labadze et al. (2023) synthesized 67 studies and concluded that students mainly benefit from homework and study assistance, personalized learning experiences, and skill development, whereas educators mainly value time-saving support and pedagogical assistance. At the same time, the review highlights reliability, accuracy, and ethical concerns, and explicitly notes contradictory findings regarding motivation, engagement, and critical thinking. McGrath et al. (2025), in a review of 23 post-ChatGPT empirical studies, describe higher education research as an emerging field dominated by both promise and threat narratives. Their analysis shows that the same technologies are framed simultaneously as tools for efficiency, creativity, and access, and as sources of academic integrity concerns, overreliance, and pedagogical disruption. Schei et al. (2024) arrive at a similar conclusion in a scoping review of 24 empirical studies: students often perceive AI chatbots as useful, motivating, and effective for writing, coding, and task support, but they also express concerns about accuracy, reliability, discipline, and possible negative effects on critical thinking and creativity. For the current study, these reviews are important because they indicate that heavy use cannot automatically be equated with maladaptive use.

Large-sample survey evidence also points to structured, background-dependent, and often purpose-driven adoption patterns. Stöhr et al. (2024), using survey data from 5,894 students across Swedish universities, found broad awareness and use of ChatGPT, whereas the use of other chatbots remained comparatively rare. Their participants mainly approached AI chatbots instrumentally, and attitudes varied by gender and field of study: male students and engineering students reported more use and more positive attitudes, while female students and students in the humanities and medicine expressed more concerns. Al Shamsi et al. (2022) similarly examined students' educational use of AI-based voice assistants and found that enjoyment, trust, perceived ease of use, and facilitating conditions were central drivers, whereas some theoretically plausible factors, including security and subjective norm, were not consistently associated with perceived usefulness. This is especially relevant for apprentices: if use is shaped by convenience, trust, curricular demands, and local norms, then psychosocial characteristics may explain only a limited part of variance in higher-risk usage patterns.

A different strand of literature focuses much more directly on psychosocial vulnerability. Hu et al. (2023) provide one of the clearest models of problematic conversational-AI use. Drawing on the I-PACE framework, they showed that social anxiety was positively associated with problematic use of conversational AI, and that this relationship was mediated by loneliness and rumination. Their study is especially valuable because it does not simply state that socially anxious individuals use chatbots more; it specifies a mechanism in which interpersonal discomfort can heighten loneliness, trigger repetitive negative thinking, and make the controllable, non-judgmental character of conversational AI especially attractive. In other words, the technology may become appealing not just because it is useful, but because it helps users avoid the uncertainty and evaluative pressure of face-to-face interaction. This line of argument strongly informed the hypotheses of the present study.

Recent work on loneliness adds nuance rather than simple confirmation. Herbener and Damholdt (2025), studying Danish high-school students, explicitly asked whether lonely youngsters turn to chatbots for companionship. Their findings support the idea that chatbot use can be meaningfully related to social connectedness, but the study also cautions against overly deterministic interpretations. Loneliness may increase openness to chatbot interaction, yet this does not mean that every lonely adolescent develops problematic reliance. A conceptually related study by Peng et al. (2025) found that loneliness significantly increased conversational-AI usage intention and that this association operated through parasocial interaction; anthropomorphic interface cues strengthened this pathway further. This matters for the current paper because it suggests that the attraction of conversational AI may depend not only on user vulnerability, but also on design features that make the system feel socially responsive. Such work supports the relevance of loneliness, yet it also implies that vulnerability may predict intention or attachment more strongly than the specific risk behaviors measured in a survey.

Studies of social and mental-health chatbots further complicate the picture because they show that vulnerability-linked use is not always harmful. Ali et al. (2024) report that people in distress may turn to social chatbots as sources of companionship and support. Kim et al. (2025), in a quasi-experimental mixed-methods study with university students, even found reductions in loneliness and social anxiety over four weeks of social-chatbot use, while still noting limits related to response consistency and user immersion. AlMaskari et al. (2025) similarly show that students evaluate AI mental-health chatbots ambivalently: participants recognized possible emotional support and accessibility benefits, but also questioned empathy, credibility, and the limits of automated care. These findings are important

because they prevent a simplistic deficit model. The same adolescents or students who appear vulnerable in one framework may experience chatbots as low-threshold support, rehearsal spaces, or temporary coping tools in another. Accordingly, psychosocial vulnerability may increase attraction to chatbots without necessarily producing the concrete pattern of risky use captured by a risk-group indicator.

Privacy, trust, and self-disclosure form a third central strand. Menon and Shilpa (2023), studying teenagers' interactions with AI-enabled voice assistants, showed that young users are capable of articulating concerns about data collection, surveillance, and misuse. This is theoretically relevant because privacy concerns could act as a protective factor: users who worry about monitoring may disclose less, maintain greater distance, and avoid emotionally dependent interaction. However, privacy concern is not the same as non-use. Leschanowsky et al. (2024), in a systematic review of 158 studies on privacy, security, and trust in conversational AI, argue that these constructs overlap substantially and are often measured inconsistently. Their review shows that users' perceptions of privacy, security, and trust are complex and not easily reducible to a single caution variable. King et al. (2025) add a governance perspective by arguing that privacy protections in frontier-model ecosystems remain difficult for ordinary users to evaluate. UNICEF's discussion of generative AI risks and opportunities for children points in a similar direction: adolescents may be aware that there are risks without being able to assess them precisely or translate concern into sustained restraint. For this reason, privacy concern may coexist with frequent use rather than reliably suppressing it.

Cross-national and contextual studies likewise caution against assuming one universal profile of "at-risk" chatbot users. Latikka et al. (2025), in a six-country study, connect social chatbot use to a broader set of individual and well-being factors, but their findings also indicate that usage is embedded in wider social and cultural contexts. What predicts social-chatbot engagement in one context may not replicate in another, particularly when the meaning of use shifts from companionship to productivity. This contextual point is reinforced by developmental research. Reviews by Ragelienė (2016) and Avci et al. (2025) characterize adolescence as a period of heightened sensitivity to belonging, identity work, peer evaluation, and social comparison. These developmental dynamics make loneliness, social anxiety, and privacy concerns theoretically plausible predictors, but they also make adolescents' relationships with chatbots highly fluid. The same apprentice may use a chatbot as a tutor, an editor, a rehearsal partner, or a confidant depending on the immediate situation.

Overall, the literature points to a genuine tension rather than a settled consensus. One body of work suggests that loneliness and social anxiety can channel some users toward more emotionally loaded or potentially problematic conversational-AI use (Hu et al., 2023; Peng et al., 2025). Another body of work shows that chatbots may provide perceived support or even short-term relief rather than harm (Ali et al., 2024; Kim et al., 2025; AlMaskari et al., 2025). A third body of work demonstrates that, in educational settings, chatbot use is often overwhelmingly instrumental and shaped by study demands, field of study, trust, usability, and institutional context (Al Shamsi et al., 2022; Stöhr et al., 2024; Schei et al., 2024; McGrath et al., 2025). Finally, privacy research suggests that concern about data practices is important but not straightforwardly behavior-limiting (Menon & Shilpa, 2023; Leschanowsky et al., 2024; King et al., 2025). Precisely because these findings are mixed, it cannot be assumed that psychosocial vulnerability variables established in other populations will cleanly distinguish risk-group membership among Swiss apprentices. Testing these predictors in a vocational adolescent sample is therefore not redundant but empirically necessary.

3. RESEARCH OBJECTIVES

The present study is designed to translate the broad concerns raised in the literature into a focused empirical test. Prior work suggests that problematic or emotionally compensatory chatbot use may be associated with psychosocial vulnerability, yet the evidence remains fragmented across educational, social, and mental-health contexts. In particular, it remains unclear whether such patterns can also be observed among apprentices in vocational education, a group whose everyday lives are shaped simultaneously by school demands, workplace expectations, and developmental transitions.

Against this background, the primary objective of the study is to examine whether selected psychosocial factors are associated with elevated risk for problematic AI chatbot use among Swiss apprentices aged 15 to 19. Rather than treating chatbot use as uniformly beneficial or uniformly risky, the study adopts a differentiated perspective and asks whether loneliness, social anxiety, and privacy concerns help to distinguish apprentices who show a higher-risk usage profile from those whose use appears more functional or routine.

The central research question is therefore formulated as follows: To what extent do loneliness, social anxiety, and privacy concerns predict whether 15- to 19-year-old apprentices in Switzerland belong to a risk group for problematic AI chatbot use?

This objective serves two purposes. Substantively, it addresses an emerging gap in the literature by extending research on problematic AI use to the vocational education context, where adolescents and young adults engage with AI tools across both learning and work-related settings. Analytically, it tests whether variables that are theoretically plausible and repeatedly discussed in adjacent strands of research also show explanatory value when risk group membership is modelled directly.

The study focuses on three predictors that capture different dimensions of the user experience. Loneliness represents a potential indicator of unmet social connectedness and has been linked in prior work to greater openness toward parasocial or companionship-oriented interaction with chatbots. Social anxiety reflects discomfort in interpersonal situations and may increase the appeal of controllable, non-judgmental communication with AI systems. Privacy concerns capture a different mechanism: they may function as an inhibiting factor that limits self-disclosure, restrains frequency or depth of use, and thereby reduces the likelihood of more problematic engagement.

Based on this framework, the following hypotheses are derived:

- **H1 (loneliness):** Higher levels of loneliness increase the likelihood of belonging to a risk group.
- **H2 (social anxiety):** Higher levels of social anxiety increase the likelihood of belonging to a risk group.
- **H3 (privacy concerns):** Higher levels of privacy concerns decrease the likelihood of belonging to a risk group.

Taken together, these objectives position the study not merely as a descriptive account of adolescent chatbot use, but as a theory-informed contribution to understanding which psychosocial conditions may, or may not, be associated with heightened risk in a rapidly expanding field of AI-supported interaction.

4. METHODICAL PROCEDURE

4.1 Research Design and Data Collection

This study employed a quantitative cross-sectional survey design to examine whether loneliness, social anxiety, and privacy concerns are associated with elevated risk in adolescents' AI chatbot use. Data were collected through an anonymous German-language online questionnaire hosted on LimeSurvey and distributed via vocational schools and training companies in Switzerland. Participation was voluntary, no financial incentives were provided, and the questionnaire could be completed on mobile or desktop devices during a regular school session.

A survey-based design was selected because the study aimed to capture individual differences in psychosocial characteristics, everyday AI chatbot practices, and indicators of potentially problematic use within a relatively large sample of apprentices. The cross-sectional design does not permit causal inference, but it allows the identification of statistical associations between psychosocial predictors and risk-related usage patterns in a population that has so far received limited attention in the emerging literature on conversational AI.

4.2 Measures

The questionnaire covered four domains: (a) sociodemographic background variables, including age and optional gender; (b) psychosocial predictors; (c) AI chatbot usage behaviour across school, workplace, and private contexts; and (d) indicators of potentially problematic or risky chatbot use. Unless otherwise noted, higher values indicate higher levels of the respective construct.

Loneliness was assessed with six items drawn from the short-form UCLA Loneliness Scale (ULS-8), answered on a 1–4 response scale. Social anxiety was measured with 15 items adapted from three established brief instruments: the Mini-SPIN, the Social Interaction Anxiety Scale short form (SIAS-6), and the Social Phobia Scale short form (SPS-6), each rated on a 0–4 scale. Privacy concerns were measured with 10 items rated on a 1–5 scale. For each psychosocial construct, item responses were combined into a mean score, provided that all of the respective items had been completed.

4.3 Operationalization of the Risk Score

Potentially problematic AI chatbot use was operationalised through a 14-item exploratory measure developed for this study. The items were designed to capture behaviours and attitudes discussed in the literature as potentially risk-related, including emotional reliance, disclosure of personal information, insufficient privacy management, unsafe platform practices, overreliance on unverified outputs, and substitution of human support by AI systems. Each item contributed with equal weight to the overall score.

All 14 items were rated on the same 1–5 response metric and averaged into a continuous Risk Score ranging from 1 to 5, with higher scores indicating more pronounced problematic or risky chatbot use. Because this instrument was newly assembled for the present study and has not yet been validated independently, the resulting Risk Score should be interpreted as an exploratory composite indicator rather than as a clinically established diagnostic measure.

Apprentices scoring in the upper quartile of the observed distribution (cut-off >= 2.43) were classified as belonging to the Risk Group.

The 14 English-language items used to compute the Risk Score were as follows:

1. I emotionally open up to an AI chatbot (e.g., private worries or feelings).
2. I share personal data (e.g., my name, school, contact details, or location).
3. For "better conversations," I would be willing to disclose more data.
4. For "better conversations," I would be willing to pay more.
5. I do not know or check the app's privacy settings.
6. I allow broad access permissions (microphone, camera, or files).
7. I try unknown AI apps or links that are sent to me.
8. I copy sensitive content (e.g., assignments or internal documents) into the chat.
9. I never check answers for accuracy or sources before using them.
10. I copy texts verbatim without rephrasing them or indicating that I used AI.
11. The AI chatbot replaces help from friends or family.
12. The AI chatbot replaces help from teachers.
13. I rely on AI for important decisions.
14. I use the AI chatbot especially when I feel lonely or anxious.

4.4 Data Preparation and Analysis

Data processing and statistical analyses were conducted in Python. Response formats were harmonised across scales before scale means were computed. Cases with incomplete questionnaires, missing key variables, implausible response patterns, or age values outside the target range of 15–19 years were excluded in accordance with the analysis plan. Usage frequencies were coded on a 1–6 ordinal scale (1 = never, 6 = daily).

The analytical strategy combined descriptive and inferential procedures. First, descriptive statistics were used to characterise the sample, AI chatbot use patterns, and the distribution of psychosocial and risk-related variables. Second, bivariate group comparisons between the Risk Group and the Non-Risk Group were conducted using t-tests, Mann–Whitney U tests, and chi-square tests as appropriate to the measurement level and distribution of the variables. Third, Pearson and Spearman correlations were calculated to examine the associations between psychosocial predictors and indicators of chatbot use. Finally, a binary logistic regression model was estimated to test whether loneliness, social anxiety, and privacy concerns significantly predicted membership in the Risk Group.

Model performance was evaluated using pseudo-R^2 values, overall classification accuracy, and the confusion matrix. All analyses were conducted on the cleaned dataset, while the logistic regression included only cases with complete data on all three psychosocial predictors. All procedures complied with institutional and cantonal ethical guidelines.

5. THE STUDY

The study was embedded within the organisational context of Swiss vocational schools, which served as institutional partners for participant recruitment. Prior to data collection, schools were informed about the study's objectives, data protection procedures and participation

requirements. Teachers agreed to allocate classroom time for the voluntary participation of apprentices, ensuring that all students had equal access to the survey.

Apprentices completed the questionnaire individually during lesson time in a controlled classroom environment. No assistance or incentives were offered and teachers refrained from influencing or monitoring participants answers. This setup ensured comparable conditions across schools and minimised contextual variability that could affect response behaviour.

5.1 Study Execution

After data collection, the raw data set of 221 cases was cleaned in Python according to the preregistered analysis plan. Cases with missing key variables were excluded. This resulted in N = 170 apprentices with valid demographic data. Figure 1 (Sample Demographics) displays the final age and gender distribution. Participants had an average age of 17.85 years (Median = 17, range 15–39), and the gender distribution was balanced, with 50% female (n = 85) and 50% male (n = 85).

Figure 1 presents the age and gender distribution of the sample. All subsequent analyses, descriptive statistics, group comparisons, correlation analyses, and logistic regression, were performed on this cleaned dataset. For the logistic regression, only cases with complete data on all three psychological predictors were retained, resulting in a subsample of 84 apprentices (22 in the Risk Group, 62 in the Non-Risk Group).

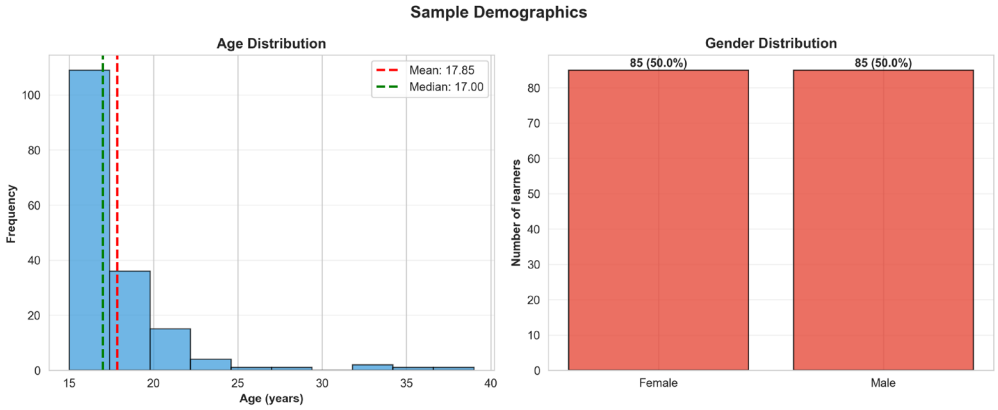

Figure 1. Sample Demographics

Scale scores for loneliness, social anxiety, and privacy concerns were computed as mean values when at least 50% of the items within each scale were answered. For the Risk Score, valid data were available for n = 170 apprentices. The 14 items capturing potentially risky AI chatbot behaviours were averaged into a continuous Risk Score (1–5), shown in Figure 2 (Risk Score Distribution). The mean Risk Score was M = 2.09 (Median = 2.00). Based on the upper quartile (cut-off ≥ 2.43), 49 apprentices (28.8%) were classified as the Risk Group, while 121 apprentices (71.2%) were assigned to the Non-Risk Group.

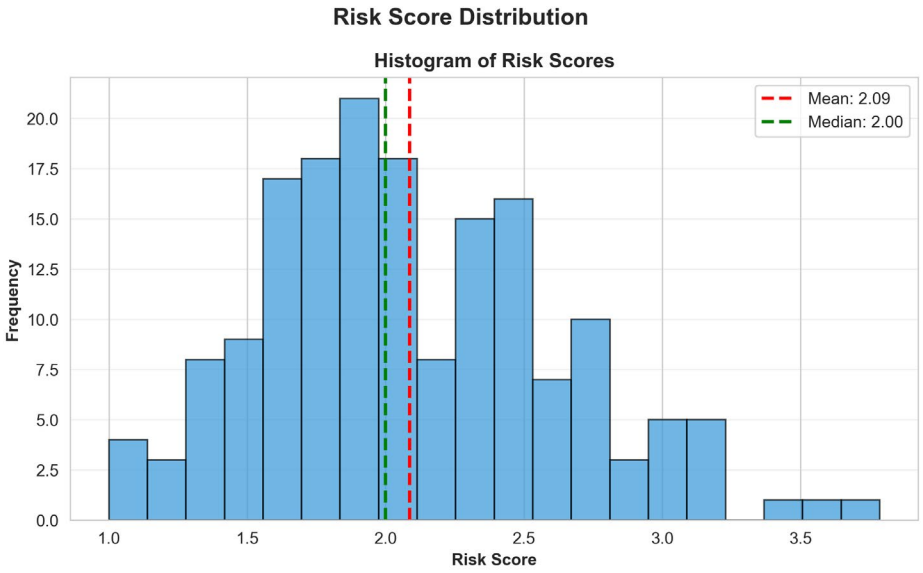

Figure 2. Risk Score Distribution

All subsequent analyses, descriptive statistics, group comparisons, correlation analyses, and logistic regression, were conducted on this cleaned data set. The logistic regression model included only cases with complete data on all predictors, resulting in a subsample of n = 170 apprentices (49 Risk, 121 Non-Risk).

5.2 Study Results

As shown in Figure 1 (Sample Demographics), the analytic sample consisted of 170 apprentices aged 15–39 years in vocational education (M_age = 17.85, Median = 17). The gender distribution was balanced (50% female, 50% male). The Risk Score (1–5) was generally low to moderate, with a mean of 2.09 and a slightly right-skewed distribution (Figure 2), indicating that most apprentices showed low-risk AI chatbot behaviour. Using the upper quartile as a cut-off (≥ 2.43), 49 apprentices (28.8%) were assigned to the Risk Group, while 121 apprentices (71.2%) belonged to the Non-Risk Group. The two groups differed clearly in their average score (Risk Group: M = 2.77, Non-Risk Group: M = 1.81), confirming that the quartile-based classification meaningfully separates higher-risk users.

AI Chatbot Usage Patterns: Across the sample, AI chatbots were used frequently, particularly in school (M = 4.84) and private life (M = 4.44). The most common motives were explaining content (87.2%), summarising (84.8%), learning (60.8%), and exam preparation (52.8%). Almost all apprentices used ChatGPT (93.6%), while other platforms played a marginal role. Group comparisons showed that Risk Group apprentices used chatbots significantly more often in all contexts (school, workplace, private). They also used chatbots more frequently for writing, translation, private purposes, and exam preparation, indicating a broader and more intensive usage pattern. Platform choice did not differ between groups.

Psychological Scales and Correlations: Apprentices reported moderate loneliness, low social anxiety, and relatively high privacy concerns. As shown in Figure 3 (Psychological Scales by Risk Group), these psychological characteristics were nearly identical in the Risk and Non-Risk Groups.

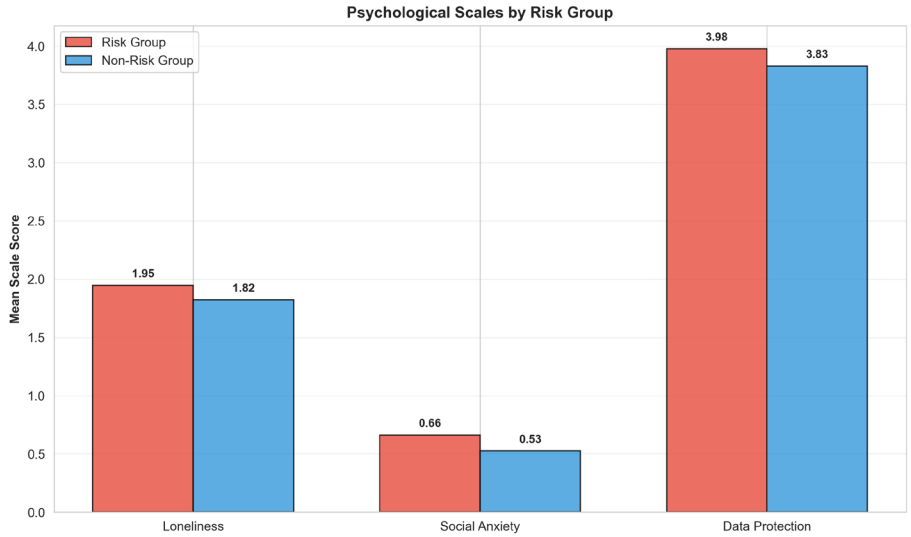

Figure 3. Psychological Scales by Risk Group

The correlation matrix (Figure 4) shows two central findings:

1 No psychological variable was meaningfully associated with the Risk Score (all r < .10, ns).
2 Loneliness, social anxiety, and privacy concerns were interrelated, confirming expected psychosocial patterns (e.g., loneliness–social anxiety r = .60).

Correlations between loneliness, social anxiety and privacy concerns with the Risk Score were all close to zero (all $| r | < .10$) and non-significant, indicating that higher levels of these psychological traits were neither reliably associated with higher nor with lower risky chatbot use in this sample. Consequently, the variance in the Risk Score was essentially unrelated to interindividual differences in loneliness, social anxiety or privacy concerns, suggesting that these traits do not function as meaningful risk markers for problematic chatbot use in this vocational-school context.

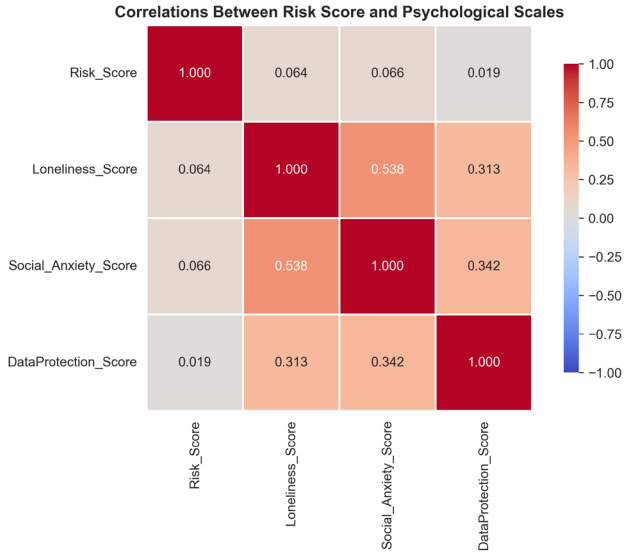

Figure 4. Correlation matrix

Psychosocial Predictors of Risk Group Membership: A logistic regression (n = 84) tested whether loneliness, social anxiety, and privacy concerns predicted Risk Group membership. Figure 5 (Odds Ratios) illustrates that:

- None of the psychological predictors reached statistical significance (all p > .10).
- All confidence intervals included an odds ratio of 1 (no effect).
- Model fit was weak, and the model failed to correctly classify the apprentices in the Risk Group.

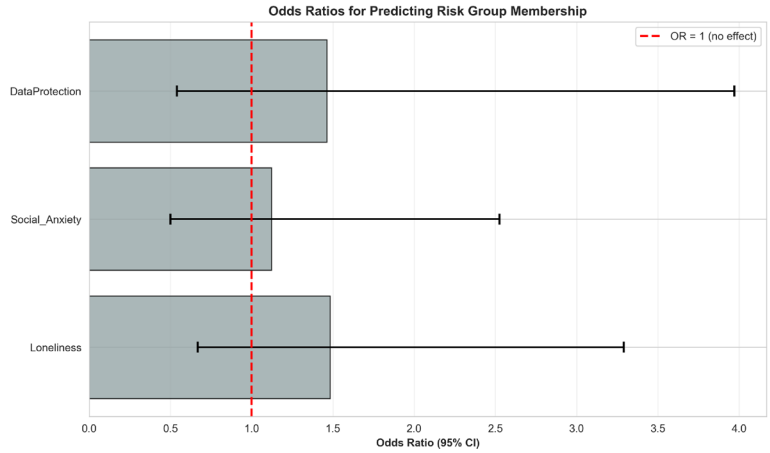

Figure 5. Odds Ratios

These results suggest that, within this sample, the psychological characteristics assessed in this study did not differentiate between apprentices classified as higher- or lower-risk based on the risk indicators.

6. CONCLUSIONS

This study examined whether loneliness, social anxiety, and privacy concerns are associated with membership in a risk group for problematic AI chatbot use among Swiss apprentices aged 15 to 19. Situated at the intersection of vocational education, adolescent media use, and emerging research on conversational AI, the study addressed an important question: whether psychosocial vulnerability helps explain which young users develop risk-related patterns of chatbot engagement. Contrary to expectations derived from parts of the existing literature, the findings did not provide evidence that the three psychosocial predictors meaningfully differentiated apprentices in the higher-risk group.

This result is theoretically relevant because it suggests that problematic or risk-related AI chatbot use among apprentices may not be reducible to a simple vulnerability profile defined by loneliness, social anxiety, or privacy concern alone. While previous studies have linked conversational-AI use to compensatory motives, emotional reliance, or privacy trade-offs, the present findings indicate that such relationships may be more context-dependent than often assumed. In a vocational education setting, chatbot use may be shaped at least as strongly by pragmatic academic demands, workplace-related tasks, convenience, peer norms, and general digital habits as by stable psychosocial dispositions. The study therefore contributes to a more differentiated understanding of adolescent AI use by showing that frequent or potentially problematic engagement does not automatically map onto the psychological risk patterns suggested in adjacent research on social or mental-health chatbots.

From an applied perspective, the findings imply that prevention and support strategies in vocational schools should not focus exclusively on supposedly vulnerable individuals. Rather, educational responses should address the broader conditions under which apprentices use AI chatbots, including norms of verification, privacy awareness, disclosure practices, dependence on automated answers, and the responsible use of AI in school and workplace contexts. This broader perspective is particularly important because several of the risk indicators used in the study concern not only emotional reliance, but also information quality, data protection, and inappropriate delegation of judgment. Accordingly, media education and AI literacy initiatives should combine psychosocial sensitivity with practical guidance on critical evaluation, safe data handling, and responsible decision-making.

At the same time, the study has several limitations that should be considered when interpreting the results. First, the Risk Score represents an exploratory composite based on newly developed items with equal weighting, and although this approach offers a broad view of potentially problematic use, it requires further validation. Future research should examine the dimensionality of the measure, test its reliability across larger and more diverse samples, and distinguish more clearly between different forms of risk, such as emotional dependence, unsafe disclosure, academic misuse, and overreliance on AI for important decisions. Second, the cross-sectional survey design does not allow causal inference. It therefore remains unclear whether psychosocial characteristics influence chatbot use, whether patterns of chatbot use

affect psychosocial well-being, or whether both are shaped by third variables such as general digital media habits, school demands, or social context.

Third, the sample was restricted to apprentices from vocational schools in Switzerland and is therefore context-specific. This focus is analytically valuable because apprentices are an educationally and socially important group, but the findings cannot be generalized without caution to other adolescent populations, countries, or educational systems. Future studies should compare vocational students with students in general secondary or tertiary education and should test whether risk-related chatbot use differs across institutional settings and age groups. Longitudinal and mixed-method designs would be especially valuable for clarifying how motives, practices, and perceived dependence on AI chatbots evolve over time. In addition, future work should examine whether other predictors—such as self-regulation, digital literacy, academic pressure, coping style, or peer influence—offer stronger explanatory power than the psychosocial variables included here.

Overall, the study contributes an empirically grounded perspective to current debates on adolescent AI use by showing that the presence of risk-related chatbot behaviours among apprentices does not necessarily coincide with the psychosocial profile often presumed in the literature. In that sense, the findings are informative not despite the absence of significant effects, but precisely because they challenge simplified assumptions about who may be at risk. The study therefore provides a basis for more nuanced theory-building, more targeted measurement development, and more context-sensitive educational interventions for the responsible use of AI chatbots in vocational education.

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