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Student Perceptions of Academic Functioning During the COVID-19 Pandemic in Germany

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Abstract: Background: The COVID-19 pandemic posed unprecedented challenges to higher education in Germany, necessitating a rapid transition to remote learning. This study evaluates the impact of the pandemic on academic functioning among German university students. Methods: An online survey was conducted with 207 students aged 18 to 35. Results: Significantly poorer academic functioning was evident during the pandemic, particularly in academic output and role satisfaction. Younger students (18 to 24 years) experienced a greater decrease in contact with teachers and lower academic output compared to older students (25 to 35 years). These findings suggest that younger students may struggle more with remote learning due to challenges in self-regulation and time management. Additionally, pandemic-induced disruptions blurred the boundaries between work and personal life, increasing stress and adversely affecting academic performance. No significant differences were found based on sex or living situation. Conclusion: Academic functioning was significantly poorer during the COVID-19 pandemic. This finding highlights the need for targeted support strategies to mitigate the negative effects of the pandemic on students' academic performance and well-being. Further research is recommended to explore the long-term implications of the pandemic on academic outcomes and student well-being.

Keywords: COVID-19; academic functioning; students; role satisfaction

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1. Introduction

The 2019 coronavirus disease (COVID-19) pandemic triggered significant disruptions across many sectors in Germany, including higher education. Restrictions imposed at the onset of the pandemic led to the closure of non-essential businesses such as shops, restaurants, night clubs, and recreational facilities. Social distancing measures were enforced, requiring individuals to maintain physical distance to curb the spread of the virus. In response, universities closed their campuses and transitioned to remote learning, prioritizing public health while ensuring academic continuity [1].

This sudden shift to online education presented unprecedented challenges, requiring quick adaptation by both university faculty and students. Students were confronted with an altered educational landscape, marked by the absence of traditional classrooms, lecture halls, and face-to-face interactions with peers and teachers [1–3]. The transition disrupted students' daily routines and necessitated adjusting to a new learning environment while maintaining social connections and academic standards [4].

For many students, accustomed to the structured routines of traditional classroom settings, remote learning demanded greater self-regulation and time-management skills.

Additionally, the closure of university campuses reduced interactions with peers, depriving students of essential emotional support. This isolation contributed to increased feelings of loneliness, anxiety, and stress [4]. Heumann et al. noted that worse perceived study conditions among German university students were associated with higher levels of depressive symptoms and anxiety [5]. Previous research has indicated that prolonged hours spent online during remote learning may exacerbate health issues such as internet addiction and anxiety [6]. Several indirect stressors, including financial hardships, decreased sleep quality, fear of contamination, and lack of personal interactions, further exacerbated these emotions [4,6–9]. Students with pre-existing mental health issues were particularly vulnerable to these problems [6,10].

Sex differences in mental health outcomes during the COVID-19 pandemic have also been observed, with female students reporting higher levels of anxiety and stress compared to their male counterparts [1,6]. While the exact reasons behind these sex differences have not been fully established, studies suggest that multiple factors, including physiological, biological, cultural, and behavioral differences, may contribute to women's heightened vulnerability to mental health issues. These sex-specific challenges may be further exacerbated during the pandemic, with social isolation, uncertainty, and disruptions to daily routines being prevalent [6,11,12]. This is reflected in the academic performance of females, with previous research showing that female students struggled more with the transition to online education, which negatively affected their schoolwork [13].

Research on academic functioning during the COVID-19 pandemic is limited. The 2023 Programme for International Student Assessment (PISA) test revealed a significant drop in academic performance of German students during the COVID-19 pandemic, including basic proficiency in mathematics, reading, and science [14]. However, there is great variability between students regarding the impact of the COVID-19 pandemic on their academic functioning. Kaspar et al. [15] conducted an online survey among 413 students from German universities and found that older students had a more positive perception of online learning and engagement in online courses. Students with better self-regulation skills, their own working place at home, and more experience with digital media were more confident with the changes to online education. Students' personality traits and state of anxiety were less important determinants of successful adaptation to online education during the COVID-19 pandemic. Similar findings were reported by Hoss et al. [16]. Other studies found that the transition to online education led to, on average, 4 h less learning time per day [17,18]. In particular, students requiring more personal attention and learning support experienced disadvantages in the transition to online education [19]. However, other students reported that they significantly benefited from distance learning [20], being able to organize study time themselves and working at their own pace.

The aim of the current study was to further evaluate the impact of the COVID-19 pandemic and the transition to online education on the academic functioning of university students in Germany. Based on previous research, it was hypothesized that compared to before the COVID-19 pandemic, academic functioning was significantly poorer during the pandemic. This effect was expected to be more profound for female students, younger students, and those living alone.

2. Methods

From November 2021 until the end of March 2022, an online survey was conducted among university students in Germany, aged 18 to 35 years. They were recruited via TU Dresden university email and printed flyers. The Ethics Committee of the Faculty of Medicine of the TU Dresden approved the study (approval code: SR-EK-8012020; date of approval: 27 September 2021) and all participants gave electronic informed consent. A prize draw was held among the participants to win one of four EUR 25 Amazon gift vouchers. The survey was designed using the open-source survey tool Lime Survey (Version 5.0.11+210727, Hamburg, Germany: LimeSurvey GmbH) and was available in

both English and German language. A extensive description of the study methodology and the dataset has been published elsewhere [21].

Demographic data collected via the survey comprised age, sex (male or female), and living situation (alone or with family or friends). Students also completed theAcademic Functioning Scale (AFS) [22]. The AFS consists of 10 items, including (1) overall performance quality, (2) amount of time invested in study, (3) study grades/output, (4) academic achievement/amount of knowledge gained, (5) reading articles/text books, (6) writing assignments/articles, (7) contact with teachers or supervisors, (8) interactions with other students, (9) balance between study and private life, and (10) the extent you enjoy being a student. Students were instructed to rate each item compared to before the pandemic (BP) on a scale ranging from −5 (extremely worse) to +5 (extremely improved). Thus, a single difference score was obtained, rating academic functioning during the COVID-19 pandemic compared to academic functioning before the COVID-19 pandemic. Three subscales were computed by averaging the corresponding item scores, labeled academic input (items 2, 5, 6, and 7), academic output (items 1, 3, and 4), and role satisfaction (items 8, 9, and 10). Recently, a validation study has been completed assessing the validity and reliability of the AFS (data on file). The Cronbach's alpha values of the subscales of academic output (0.8), academic input (0.7), and role satisfaction (0.7) were acceptable, and the test–retest reliability, assessed with intraclass correlations, of the subscales of academic output (0.8), academic input (0.7), and role satisfaction (0.7) were moderate to good.

Statistical analyses were conducted with SPSS (IBM Corp. Released 2013. IBM SPSS Statistics for Windows, Version 29.0. Armonk, NY, USA: IBM Corp.). Mean and standard deviation (SD) were computed for all variables. Comparisons with BP of the individual items and the scale scores for academic input, academic output, and role satisfaction were made with one-sample *t*-tests. A Bonferroni correction was applied, and differences from BP were considered significant if $p < 0.005$ (2-sided) for individual items. Differences from BP for scale scores were considered significant if $p < 0.05$ (2-sided). Between-group comparisons of scale scores were conducted with the paired-sample *t*-test. Groups were formed according to sex, age, and living situation. A Bonferroni correction was applied, and differences between groups were considered significant if $p < 0.005$ (2-sided) for individual items. Differences between groups for scale scores were considered significant if $p < 0.05$ (2-sided).

3. Results

A total of 207 students participated in the study. Their demographics are summarized in Table 1. Data on academic functioning are summarized in Table 2.

Table 1. Demographics.

Variables Assessed	Overall
N	207
Age (years), Mean (SD)	24.4 (3.4)
Age Group	
Young (18–24 years old), N (%)	114 (55.1%)
Old (25–35 years old), N (%)	93 (44.9%)
Sex	
Male, N (%)	58 (28.0%)
Female, N (%)	149 (72.0%)
Living Situation	
Alone, N (%)	62 (30.0%)
Living with Family or Friends, N (%)	145 (70.0%)

Table 2. Academic functioning.

Items, Mean (SD)	Overall	*p*-Value
Role satisfaction	−0.98 (2.6)	<0.001 *
Balance of study–private life	−1.51 (2.4)	<0.001 *
Interactions with students	−2.67 (2.2)	<0.001 *
Contact with teachers	−1.97 (2.3)	<0.001 *
Reading	0.01 (2.2)	0.972
Writing	0.20 (2.1)	0.226
Academic achievement	−0.60 (2.5)	0.002 *
Grades/output	−0.14 (2.3)	0.420
Time invested	−0.01 (2.5)	0.975
General performance quality	−0.90 (2.2)	<0.001 *
Scale scores, mean (SD)		
Role satisfaction	−1.72 (1.9)	<0.001 *
Academic output	−0.55 (2.0)	<0.001 *
Academic input	0.05 (1.8)	0.698

Mean, standard deviation (SD), and *p*-values are shown. Significant differences ($p < 0.005$ for individual items, after Bonferroni's correction, and $p < 0.05$ for scale sores) from BP are indicated by *.

Students reported significantly poorer academic functioning during the COVID-19 pandemic compared to BP, particularly in terms of academic output and role satisfaction (see Table 2 and Figures 1A and 2A). No significant difference compared to BP was found for academic input. In addition to the overall findings, subgroup analyses revealed significant differences between younger and older students (see Figures 1B and 2B). Compared to older students, academic output and role satisfaction were significantly poorer among young students. While younger students reported poorer academic input, older students reported an improvement in academic input during the COVID-19 pandemic. No significant differences were found according to sex (see Table 3) or living situation (see Table 4).

Table 3. Academic functioning according to sex.

Items, Mean (SD)	Men	Women	*p*-Value
Role satisfaction	−0.94 (2.7)	−1.00 (2.5) *	0.891
Balance of study–private life	−1.45 (2.4) *	−1.53 (2.5) *	0.849
Interactions with students	−2.49 (2.5) *	−2.74 (2.1) *	0.507
Contact with teachers	−2.00 (2.4) *	−1.95 (2.3) *	0.899
Reading	0.06 (2.0)	−0.02 (2.2)	0.836
Writing	0.16 (2.1)	0.21 (2.1)	0.878
Academic achievement	−0.73 (2.4)	−0.54 (2.5)	0.661
Grades/output	−0.65 (2.4)	0.07 (2.2)	0.054
Time invested	0.06 (2.2)	−0.03 (2.6)	0.824
General performance quality	−1.10 (2.1) *	−0.82 (2.3) *	0.457
Scale scores, mean (SD)			
Role satisfaction	−1.63 (2.1) *	−1.76 (1.9) *	0.692
Academic output	−0.82 (2.0) *	−0.43 (2.0) *	0.234
Academic input	−0.09 (1.6)	0.11 (1.9)	0.507

Mean difference scores from pre-COVID-19, standard deviation (SD, between brackets), and *p*-values are shown. Significant differences ($p < 0.005$ for individual items, after Bonferroni's correction, and $p < 0.05$ for scale sores) from before the COVID-19 pandemic (BP) are indicated by *. No significant sex differences ($p < 0.005$ for individual items and $p < 0.017$) were found.

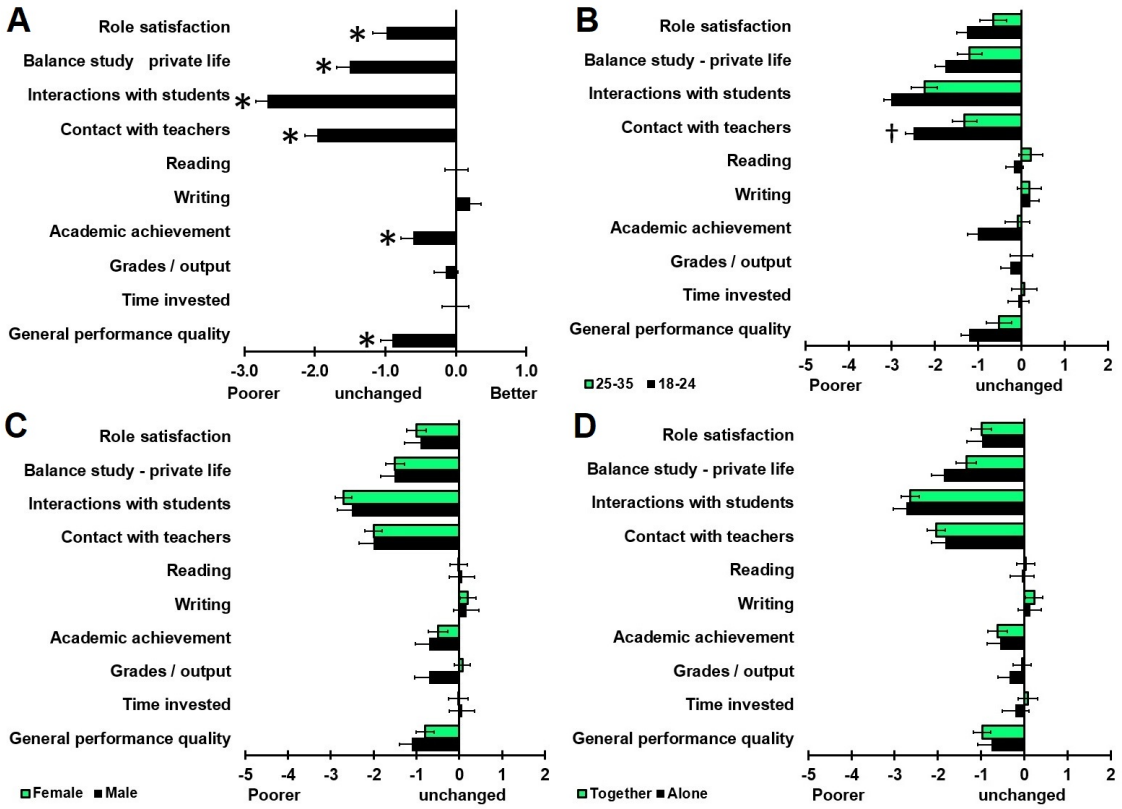

Figure 1. Academic functioning individual item scores. Mean difference scores from pre-COVID-19 and standard error are shown for (**A**) overall sample, (**B**) young versus older students, (**C**) males versus females, and (**D**) students living alone versus students living together with family or friends. Significant differences from before the COVID-19 pandemic (BP) ($p < 0.005$, after Bonferroni's correction) are indicated by *. Significant differences between the groups ($p < 0.005$, after Bonferroni's correction) are indicated by †.

Table 4. Academic functioning according to age group and living situation.

Academic Functioning	According to Age Group			According to Living Situation		
Items, Mean (SD)	**18–24**	**25–35**	***p*-Value**	**Alone**	**Together**	***p*-Value**
Role satisfaction	−1.25 (2.5) *	−0.65 (2.7)	0.129	−0.96 (2.7)	−0.99 (2.5) *	0.947
Balance of study–private life	−1.75 (2.4) *	−1.19 (2.4) *	0.133	−1.85 (2.2) *	−1.34 (2.5) *	0.198
Interactions with students	−3.00 (1.8) *	−2.25 (2.7) *	0.028	−2.73 (2.3) *	−2.64 (2.3) *	0.810
Contact with teachers	−2.48 (2.0) *	−1.31 (2.5) *	<0.001 †	−1.82 (2.4) *	−2.03 (2.3) *	0.568
Reading	−0.16 (2.0)	0.22 (2.4)	0.246	−0.05 (2.0)	0.03 (2.2)	0.804
Writing	0.21 (1.9)	0.18 (2.4)	0.940	0.13 (2.0)	0.23 (2.2)	0.774
Academic achievement	−1.00 (2.3) *	−0.09 (2.5)	0.015	−0.55 (2.4)	−0.62 (2.5)	0.850
Grades/output	−0.25 (2.2)	0.00 (2.3)	0.473	−0.33 (2.1)	−0.05 (2.3)	0.452
Time invested	−0.06 (2.4)	0.06 (2.5)	0.736	−0.20 (2.3)	0.08 (2.5)	0.480
General performance quality	−1.21 (1.9) *	−0.52 (2.5)	0.043	−0.75 (2.4)	−0.97 (2.1) *	0.529
Scale scores, mean (SD)						
Role satisfaction	−2.00 (1.6) *	−1.36 (2.2) *	0.032 †	−1.85 (1.8) *	−1.66 (2.0) *	0.550
Academic output	−0.82 (1.8) *	−0.20 (2.1)	0.042 †	−0.54 (1.9) *	−0.55 (2.0) *	0.976
Academic input	−0.35 (1.6) *	0.56 (1.9) *	<0.001 †	-0.01 (1.5)	0.08 (1.9)	0.758

Mean difference scores from pre-COVID-19, standard deviation (SD, between brackets), and *p*-values are shown. Significant differences ($p < 0.005$ for individual items, after Bonferroni's correction, and $p < 0.05$ for scale sores) from before the COVID-19 pandemic (BP) are indicated by *. Significant group differences ($p < 0.005$ for individual items and $p < 0.017$ for scale sores, after Bonferroni's correction) are indicated by †.

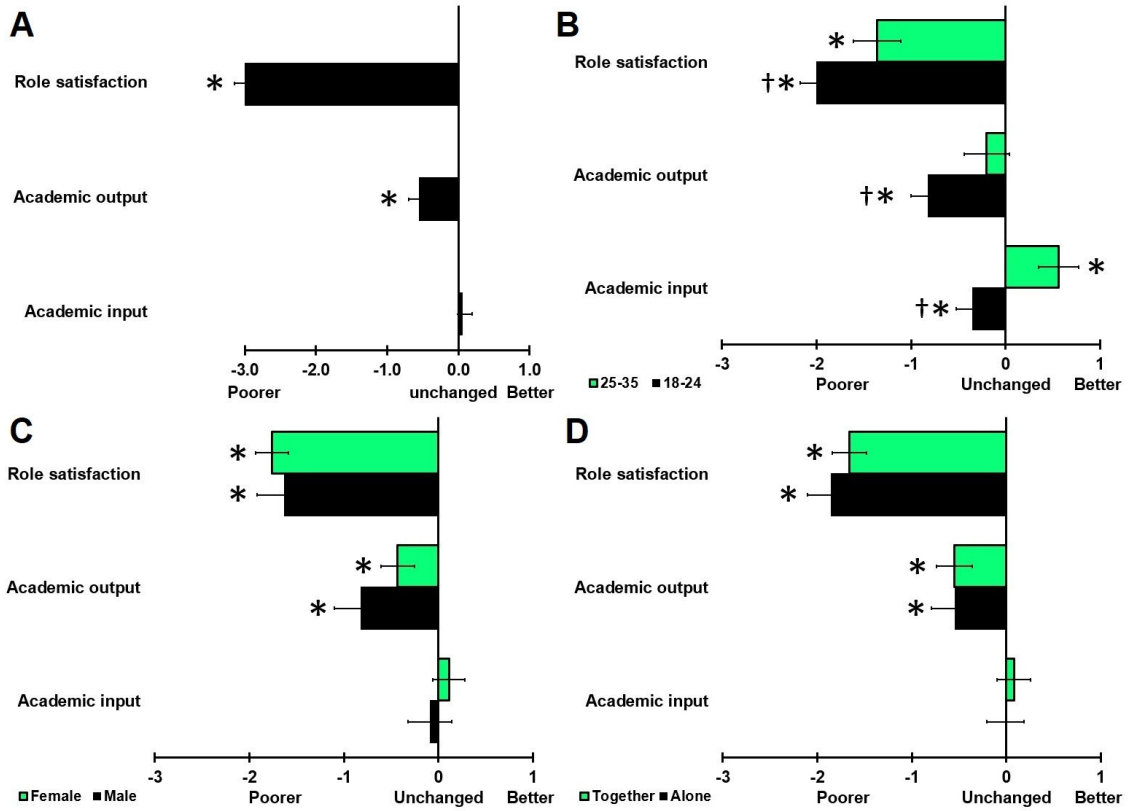

Figure 2. Academic functioning scale scores. Mean difference scores from pre-COVID-19 and standard error are shown for items of the Academic Functioning Scale for (**A**) overall sample, (**B**) young versus older students, (**C**) males versus females, and (**D**) students living alone versus students living together with family or friends. Significant differences from before the COVID-19 pandemic (BP) ($p < 0.05$) are indicated by *. Significant differences between the groups ($p < 0.05$) are indicated by †.

4. Discussion

This study showed that academic functioning of students in Germany was significantly poorer during the COVID-19 pandemic, accompanied with a significantly poorer student work–life balance. These findings align with the results of previous studies [23–27], including studies using the same Academic Functioning Scale in the Netherlands [22], Argentina [28], and Turkey [29]. The pandemic-induced shift to online learning also disrupted the traditional separation between academics and leisure, further decreasing work–life balance [24]. Several possible causes, which were not assessed in the current study, could account for these findings. For example, without the structure of in-person classes and campus activities, students may have struggled with motivation and time management, which could increase stress levels and lead to students feeling overwhelmed and exhausted [30,31]. These factors have previously been shown to negatively impact academic performance [32–34]. The COVID-19 pandemic and associated lockdown periods may have particularly impacted students who were accustomed to clear delineations between their academic and personal lives, given that Germany is known for maintaining a strict work–life separation [35–37]. The observed decrease in role satisfaction may be related to challenges in online work, such as reduced social interactions, difficulties in maintaining a healthy work–life balance, and constrained access to support services [1,38]. The lack of campus life and community traditionally experienced by students may have contributed to feelings of isolation and lowered role satisfaction [39–42].

Consistent with existing research, the decreases in academic output and interactions with peers and teachers highlight the limitations of online learning during the COVID-19

pandemic [42,43]. Home distractions, technical difficulties, and the absence of direct contact with teachers or peers may have contributed to this decline [44,45]. While some students benefitted from online lessons, limited interaction with teachers and peers may have hindered their ability to seek help or feedback, affecting their academic performance [46,47]. Teachers and peers provide important academic support through collaborative discussion and feedback. Virtual alternatives like office hours and emails do not fully replicate the face-to-face interactions [48], leading to a decline in students' motivation, academic support, and ultimately to a decline in their academic performance.

Student stress and anxiety have likely worsened academic challenges accompanying the COVID-19 pandemic [5,46], leading to difficulties in concentration, information retention, and performance [49,50]. Mental health issues among university students have been associated with poorer academic performance, creating a negative spiral [51–53]. The COVID-19 pandemic restrictions (e.g., the lockdown periods) have exacerbated these challenges, leading to increased screen time, sedentary lifestyles, disrupted sleep, and decreased physical activity. These lifestyle changes impact students' overall well-being and contribute to a decline in academic performance and success [54,55]. From a different perspective, the COVID-19 pandemic may have caused uncertainty about post-graduation prospects for German university students. Economic instability and industry disruptions affected traditional career paths, leading students to reassess their career plans. This could have also increased stress, anxiety, and diminished academic motivation [56–58].

Interesting age differences were observed. First, a significant decrease in contact with teachers was found among 18-to-24-year-olds compared to those aged 25–35. Younger students may rely more on in-person interaction for guidance and support [59,60]. Since many of these students recently finished high school, they are likely more accustomed to face-to-face interactions. The shift to remote learning disrupted this mode of communication, leading to a sense of disconnect [61]. Additionally, the younger age group may place greater value on mentorship and guidance, which may have been reduced with online learning, impacting their support and motivation [62,63]. Second, a difference in academic output was evident with significantly lower academic output in students aged 18–24 and relatively unchanged academic output in students aged 25–35. This may be due to the stage of their university education, with younger students likely having only recently started their studies. They may still be adapting to university life and learning methodologies [64–66]. The sudden shift to remote learning added complexity, requiring them to adjust to a new learning environment remotely. This dual adaptation process likely contributed to the observed differences in academic output. Wood et al. [4] found that younger students are more likely to experience higher stress levels, depression, and anxiety due to the abrupt lifestyle change from high school to college, lowering their academic performance. Additionally, the lack of social interaction and peer support may have disproportionately affected younger students, decreasing their motivation and productivity [67,68].

In line with reduced academic output, a decrease in academic input among 18-to-24-year-olds was observed. Younger students may face more challenges with self-regulation and time management. The shift to online learning required greater autonomy and self-discipline [69], which younger students may have found difficult [70]. Older students, with more experience in higher education, tend to have better self-regulation [71,72]. The lack of structured routines and blurred boundaries between home and study environments may have also played a role [73]. The lockdown periods reduced structure in attending classes, study periods, or extracurricular activities. Without physical classroom cues, younger students may have struggled to establish new study habits at home [74]. Additionally, the home environment likely presented distractions, making it difficult to maintain consistent engagement [75–77].

Finally, we observed no significant differences between sexes for items of the academic functioning, in line with German research [1], and no differences were found according to living situation.

Limitations

While this study provides valuable insights into the academic performance of university students in Germany during the COVID-19 pandemic, several limitations should be considered when interpreting the findings.

First, the recruitment method relied primarily on TU Dresden university email and printed flyers, which may introduce sampling bias by excluding students from other universities and those who did not engage with the provided materials. As participation was voluntary, there was possibly a self-selection bias (as participants may differ from non-participants). Taken together, it is unknown to what extent the current convenience sample is representative of all students in Germany. Related to this, other countries have different cultures and academic settings, and COVID-19 measures (e.g., lockdown periods, transition to online education or not) differed between countries. Therefore, the generalizability of the current findings among students in Germany is unknown. Nevertheless, replications of this survey in other countries including the Netherlands, Argentina, and Turkey yielded comparable results [22,28,29].

Second, the use of self-reported measures may have introduced measurement error as well as social desirability bias, potentially affecting the accuracy of the reported academic functioning outcomes. Also, reliance on retrospectively self-reported data may have introduced recall bias, thereby not accurately reflecting participants' actual experiences. Future studies could verify self-reports by connecting these to objective university records (e.g., grade point average).

Third, the study collected limited demographic data, focusing primarily on age, sex, and living situation, while other important demographic factors that could influence academic performance, such as socioeconomic status, ethnicity, lifestyle (e.g., sleep [78] and alcohol consumption [79]), and pre-existing mental health conditions, were not included in the analysis. Future studies should take these factors into account.

Finally, it can be questioned to what extent student's academic functioning after the COVID-19 pandemic has returned to the levels seen prior to the COVID-19 pandemic. Further research is needed to examine the latter, and explore the possible long-term, persisting implications of the changes in education implemented during the COVID-19 pandemic on students' academic performance and well-being.

5. Conclusions

The COVID-19 pandemic significantly impacted higher education in Germany, particularly affecting university students. The sudden shift to online education led to decreased academic functioning, with students reporting lower levels of output and satisfaction with being a student. Younger students appeared to be disproportionately affected. No relevant sex differences were found. These findings highlight the need for tailored support and interventions to address the challenges faced by students during and beyond future pandemics.

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Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: The data are published open access in the MDPI journal Data and are available online as Supplementary Materials to reference [21].

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