# Instructors' Stressors, Stress, and Resources During Remote Teaching in the COVID-19 Pandemic: the Role of Gender and Professional Status

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## Abstract

With the rapid transition to remote teaching during the pandemic, higher education instructors have been confronted with unprecedented challenges, particularly the management of interpersonal relationships in online formats. To date, little research investigated instructors' work experiences during the pandemic. This paper provides insights into a) aspects that instructors found stressful and aspects they reported as resources, b) instructors' levels of stress and stressors, and c) the extent to which instructors perceived personal and social resources to cope with stress. In two studies, we analyzed the data of a two-wave survey with independent samples of 157 (W1, Spring 2020) and 128 (W2, Fall/Winter 2020/2021) instructors, respectively. In Study 1 (qualitative), we identified specific stressors and resources reported by instructors finding that they most frequently mentioned interpersonal aspects as stressors *and* resources. In Study 2 (quantitative) we compared stress levels, stressors, and available resources at both waves considering instructors' gender and professional status. Unexpectedly, we found no gender differences in experienced stress levels. Yet, there were significant differences in perceived personal and social resources. At both times, female compared to male instructors reported a more positive social teaching self-concept and higher institutional support. At W1 and W2, mid-level staff perceived higher levels of stress compared to lecturers. After 9 months in the pandemic, mid-level staff reported higher online self-efficacy compared to professors. We discuss our findings in terms of their implications as the global digital transformation of teaching in higher education continues to unfold.

## Keywords

higher education instructors, stressors, personal and social resources, remote teaching, COVID-19 pandemic

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## 1 Introduction

With the outbreak of the COVID-19 pandemic almost all business sectors and public services had to react to restrictions on social contact imposed by governments. To protect staff and students from the virus, higher education institutions quickly postponed or cancelled all campus related activities, including in-class teaching or (particularly) lab-based research. Instructors in higher education were confronted with unprecedented and uncommon challenges, such as the transition to online-tools on short-notice, the use of uncommon digital teaching tools and the need to establish relationships with students in digital learning environments. All this while instructors faced multiple challenges in private and family, e. g., home-schooling and taking care of children and relatives during working hours. These new occupational challenges can be considered as stressors, i. e., factors that are perceived as *too* demanding or even threatening – which may or may not exceed the person's resources. Job demands-resources (JD-R) theory (Bakker & Demerouti, 2017; Demerouti et al., 2001) presumes that individual stress reactions to challenges do not only depend on the quality of the event itself (e. g., intensity), but also on the available personal resources (e. g., self-efficacy) and (social) job resources (e. g., support from colleagues), potentially buffering challenging and highly stressful experiences. To date, little research investigated the aspects higher education instructors found particularly stressful or perceived as resources (for challenges see Zarei & Mohammadi, 2021), the extent to which instructors perceived stress, and which resources they could fall back on to cope with challenges considering the role of gender and professional status. The present study addresses this gap and examines instructors' work experiences and perspectives in the first (W1, Spring 2020) and the second online semester (W2, Fall/Winter 2020/2021) of the pandemic with independent samples at each wave. Using a mixed-method approach, we first present precise descriptions of the stressors and resources perceived by instructors (qualitative, Study 1) and then describe stress levels, stressors, and resources at two times separated by different groups of instructors considering gender and professional status (quantitative, Study 2).

## 2 Instructors' Perceived Stressors, Stress, and Resources During Remote Teaching: the Role of Gender and Professional Status

### *2.1. Defining Stress*

A common feature of established stress theories is that stress occurs as a combination of external stimuli (sources of stress or stressors) and individual responses (outcome or manifestation of stress or strain; Lazarus, 1966). Within the transactional model of stress and coping, individuals appraise challenges and events as demanding or threatening in relation to their individual resources to cope with the problem (Lazarus, 1966; Lazarus & Cohen, 1977). In this process, individuals first appraise the stressor and then appraise

their own ability to cope with it (Lazarus & Folkman, 1984). Negative stressors are expected to occur when a situation is perceived as *too* demanding or threatening for prolonged time periods, i. e., when people believe that they lack the resources needed to cope with the situation. Similarly, person-environment fit theories (P-E Fit) suggest that stress arises from a misfit between a person's abilities or resources and environmental demands. While there can be a misfit between objective demands in the environment and objective abilities it is the fit of subjectively perceived demands and fit that predicts perceived strains and experiences of stress (Edwards et al., 1998). Thus, there is consensus across models that stress is the result of a highly subjective process: Given similar stressors, some employees can perceive high levels of stress while others do not. In the present research we focused on describing the subjective stressors and levels of stress that instructors reported during the two first semesters during the pandemic.

### *2.2 Environmental Stressors and Stress Experiences During the Pandemic*

In higher education, the rapid transition to remote teaching and online research-related activities have resulted in unexpected occupational challenges for academic staff. Current research on stress experiences in academic settings has focused primarily on students' (e. g., Cao et al., 2020; Planchuelo-Gómez et al., 2020) or school teachers' (e. g., Košir et al., 2020) stress levels during the COVID-19 pandemic. To date, only little research has investigated higher education instructors' perceived stressors and stress experiences. The few studies on academic staff's experiences during the pandemic found that academic employees reported difficulties to combine work with family, an increased workload, technical challenges, little time for research and difficulties to communicate with and meet the needs of students including those with mental health issues (see Chang & Fang, 2020; Navarro-Espinosa et al., 2021; Watermeyer et al., 2020; Zarei & Mohammadi, 2021), all signaling a mismatch between objective and subjectively perceived environmental demands and objective and subjectively perceived abilities and resources.

Rosen et al. (2010) developed a taxonomy of *work stressors* based on Jex (1998) and the National Institute for Occupational Safety and Health (NIOSH, 1999). The taxonomy includes the dimensions 1) work role stressors, 2) workload, 3) situational constraints, 4) job control, 5) social characteristics of the workplace, 6) career-related norms, and 7) job conditions. In the academic context during the pandemic, *work role stressors* could include role ambiguity, role conflict, and role overload, e. g., acting as an instructor, researcher and parent simultaneously. *Workload* in the academic context could include both objective quantitative information such as amount of work to be completed (e. g., the number of lectures that need to be transformed into digital learning formats while adapting to the challenges of continuing research projects under pandemic conditions) and subjective qualitative perceptions about the workload (e. g., difficulty of tasks, again depending on individual abilities and perceived standards). *Situational constraints* could consist of organizational factors such as bureaucracy, equipment and fittings or the degree of insti-

tutional digitalization (e. g., the extent to which the institution provides or has prepared the opportunity to switch to digital forms and procedures). *Job control* in the university could include the extent to which instructors have had the opportunity to make autonomous decisions or to participate in the decision-making processes. *Social characteristics* in the academic settings could include interpersonal conflicts, the lack of cooperation in the exchange of material and support among colleagues but also relationships to students. *Career-related norms* in the university setting could refer to levels of job insecurity (which often differ depending on the professional status), advancement opportunities, and the perceived interference of academic work with nonwork domains (e. g., family), the latter of which includes formalized or unspoken institutional policies in supporting compatibility of work and family life. *Job conditions* in the academic settings during the pandemic could include physical aspects (e. g., shared working space at home), the nature of job tasks (e. g., primarily teaching or research), or the time structure (e. g., long working hours, break schedules, necessity of working unpaid overtime).

In the present study, the seven dimensions were applied in the qualitative analysis to explore stressors that instructors experienced in the first online semester. A growing body of research has been investigating work-specific stressors for academic staff in higher education suggesting the usefulness of the model by categorizing instructors' perceived stressors using the model by Rosen et al. (2010). For example, role overload and variability in different demands through the academic year, long working hours (on and off campus), little time available for research, paperwork, administration, and feelings of being underappreciated have been reported as work-specific stressors for academics (see Brown et al., 1986; Curran & Prottas, 2017; Johnson et al., 2019; Kinman, 2001; Lease, 1999) and can be assigned to the categories postulated by Rosen et al. (2010). Considering the particular characteristics of remote teaching and working we identified specific stressors perceived by our respondents in the first online semester in the qualitative Study 1.

### *2.3. The Role of Gender and Professional Status for Perceived Stressors and Stress Experiences*

Only a few pre-pandemic studies have examined university employees' work stressors and stress and reported their results considering gender or professional status. In the studies reporting these characteristics, there are some inconsistent findings regarding higher education instructors' experience of stressors and stress by gender. While some studies show no gender differences in stress levels of higher education staff (e. g., Abouserie, 1996), other studies report higher levels of stress among female compared to male academics (Archibong et al., 2010; Brown et al., 1986; McInnis, 1999; Richard & Krieshok, 1989; Thorsen, 1996) which are typical findings of studies on stress experiences outside the academic setting (e. g., Kneavel, 2021; Matud, 2004). There are various factors related to female instructors' higher levels of stress, such as academia being a male dominated occupation still, the lack of female role models, or stressors such as difficulties to balance professional

and child care duties, the latter of which still have been found to more frequently affect women (e. g., Doyle & Hind, 1998), particularly during the pandemic (Krukowski et al., 2021; Langin, 2021; Morgan et al., 2021; Yildirim & Eslen-Ziya, 2021). Indeed, current research investigating the impacts of the pandemic on female and male academics found notable career-related disadvantages for women. For example, female academics' productivity decreased by 13.2% relative to their male counterparts (Cui et al., 2021). Another study investigating manuscript submissions and the ability to meet deadlines found that regarding these career aspects male academics were less affected by the pandemic circumstances than women (Staniscuaski et al., 2021). Indirectly, these findings suggest higher experiences of stress among female instructors.

In terms of professional status, some pre-pandemic studies found that lecturers have the highest stress levels, followed by research assistants and tutors. For example, in a mixed-method study published in 1996, Abouserie reported the lowest stress levels among professors and the highest stress levels among lecturers. Yet, it can be expected that there are considerable variations across academic settings and countries.

Overall, there is a scarcity of research exploring the role of gender and professional status on the perception of stressors and stress during the pandemic. We therefore systematically examined stress levels as well as levels of different stressors (i. e., technical challenges, teaching effort, little time for research) during the pandemic in the quantitative analysis considering gender and professional status (Study 2).

### *2.4 Psychological Personal and Social Resources*

As noted, stress will typically be the result of a highly individualized process of weighing environmental demands or stressors and a person's abilities to meet these demands. Yet, previous research has found that there are personal and social resources that are generally associated with lower levels of stress.

Challenging job situations like the COVID-19 pandemic are not necessarily perceived as negative workplace stressors (Faragher et al., 2004). Stress reactions to challenges can vary depending on subjective personal resources (i. e., self-efficacy) and (social) job resources (i. e., colleague and supervisor support; see Bakker & Demerouti, 2017; Demerouti et al., 2001).

*Personal resources.* In the present chapter we apply the concept of *psychological capital* (Luthans & Youssef, 2004) as an overarching framework for personal resources. It distinguishes four subdimensions self-efficacy, hope, resilience, and optimism. *Self-efficacy* is defined as people's confidence in their ability to mobilize the motivation, cognitive resources, and courses of action necessary to execute a specific course of action within a given context (Bandura, 1977). *Hope* is defined as a motivational state that is based on the interaction between goals, agency, and pathways. Hopeful people are driven to achieve

their goals by their sense of agency, which provides them with a determination and willpower to invest the energy necessary to accomplish their goals (Snyder, 1994). *Resilience* in people results when they show the capacity to bounce back from adversity, uncertainty and failure. Resilient people have been found to make use of individual and environmental protective mechanisms enhancing the assets and/or reducing risk factors within a situation (e. g., Masten, 2001). *Optimist* people respond to adversity by interpreting adverse events in a positive way, often attributing positive events to internal and permanent causes and negative events to external and situation-specific ones (Seligman, 1998). Individuals with such high psychological capital have been found to engage in behaviors that benefit the organization and are less likely to think about quitting their job (Avey et al., 2010).

Considering the specific situation of instructors during the first two semesters of remote teaching in the pandemic, we applied the four subdimensions of psychological capital (Luthans & Youssef, 2004) to explore personal resources in the qualitative analysis (Study 1). Additionally, we considered instructors' academic online self-efficacy, social teaching self-concept, and teaching joy as personal resources in the quantitative analysis (Study 2). So far, there are some inconsistent findings regarding higher education instructors' personal resources such as self-efficacy beliefs by gender and professional status depending on the domain under consideration. Research investigating self-efficacy beliefs among university staff found that male instructors report significantly higher values than women (e. g., Landino & Owen, 1988; Vasil, 1992). While some studies found significant gender differences regarding computer self-efficacy with female faculty reporting lower values (e. g., Kagima & Hausafus, 2000), other studies showed no gender differences in self-efficacy beliefs for internet usage (cf. Gültekin et al., 2020).

*Social resources.* A large body of research shows that social support is a valuable means to counteract stress. It has been found to be generally relevant for physiological and psychological health outcomes (e. g., Taylor, 2007, see also Taylor et al., 2010), and – in organizational contexts – to lower overall stress, perceived stressors and to increase job satisfaction (for reviews see Taylor, 2011; Viswesvaran et al., 1999; for school teachers see Košir et al., 2020, for relationships between work and family see Kossek et al., 2011). Whereas definitions vary widely, social support can be distinguished into four types of supportive behaviors, namely *emotional support* (i. e., providing empathy, caring, love, trust, esteem, concern, and listening), *instrumental support* (i. e., providing aid in kind, money, labor, time, or any direct help), *informational support* (i. e., providing advice, suggestions, directives, and information for use in coping with personal and environmental problems), and *appraisal support* (i. e., providing affirmation, feedback, social comparison, and self-evaluation; see House, 1981). Research found that, overall, academics in higher education were satisfied with the level of social support they obtained from their colleagues (e. g., Daniels & Guppy, 1994). Recent research in the school setting has found that teachers reported different social resources as helpful during the pandemic, particularly the support of their

supervisor, their colleagues, and their family (e. g., Hatzichristou et al., 2021; Košir et al., 2020).

To explore the importance of different social resources during the pandemic, we categorized instructors' perceived resources according to the four types of supportive behaviors (House, 1981) in the qualitative analysis (Study 1). In the quantitative analysis (Study 2) social resources were considered in the form of a cooperative and supportive climate among colleagues and institutional support.

In general, women tend to have stronger social goal orientations than men (Eagly & Crowley, 1986; see also Taniguchi, 2006; Teoh et al., 2015) and have been found to be more effective in eliciting social support (Sarason et al., 1985; Shumaker & Hill, 1991; for the likelihood of providing support depending on challenges, see Neff & Karney, 2005; for an overview, see Barbee et al., 1993). Because to our knowledge there is, at the moment, no research investigating the extent of social support perceived by male and female higher education instructors nor differences depending on professional status (for an exception of a study on academic staff in South Africa that reveals no significant gender differences, see Rothmann & Jordaan, 2006) we systematically explored differences in the present study.

### *2.5 The Present Research*

In our study we aimed to provide detailed insights into instructors' stress experiences during the first two semesters in the pandemic where all teaching was done remote. In a qualitative (Study 1) and quantitative study (Study 2), we investigated a) stressors that instructors encountered, their stress experiences, and (b) personal and social resources they could draw on. While in our qualitative study we identified instructors' stressors and resources in the first online semester of the pandemic (W1, Spring 2020), in our quantitative study we made use of two cross-sectional data sets of the first and second online semester of the pandemic (W1, Spring 2020 and W2, Fall/Winter 2020/21).

Our research was guided by two goals: 1) to describe the stressors, personal, and social resources that university instructors perceived during the onset of the pandemic (W1) and 2) to quantify differences in perceived stress, stressors, and resources between an earlier stage of the pandemic (W1) and half a year later (W2) considering instructors' gender and professional status.

# 3 Material and Methods

## *3.1 Data Analytic Strategy*

*Qualitative content analysis (Study 1).* To identify and explore stressors and resources we conducted a theory-based qualitative content analysis in the form of a frequency analysis using the program MAXQDA (VERBI Software, 2021; for frequency analyses see Mayring, 2015, p. 13ff.). To identify stressors during the pandemic we used seven of the eight-category taxonomy of work stressors developed by Rosen et al. (2010) and coded the reported aspects into these categories. To examine personal resources, we adopted the theoretical framework of psychological capital with the four subdimensions hope, self-efficacy, resilience, and optimism (Luthans & Youssef, 2004) and allocated the statements to these definitions. To determine social resources, we focused on aspects related to social support based on the four supportive behaviors according to House (1981). We deduced a category system based on these concepts while not excluding the possibility to inductively introducing new categories during the analysis, as proposed by Mayring (2015). In particular, we applied a deductive use of categories, operationalizing key categories based on definitions identified in the literature. We further specified definitions and introduced categories to the coding system (see Mayring, 2015, p. 97ff.). For example, during the coding process we added the category *digital teaching and working* including additional relieving factors for instructors during the pandemic. In the next step, we structured the data based on the category system (Kuckartz, 2016; Mayring, 2015, p. 103). During the analysis, we followed four steps (see Mayring, 2015): (1) As recommended, to guarantee objectivity and reliability we developed a coding manual for coders with an introduction and a list of categories combined with definitions, examples and respective coding rules. (2) We examined the data and sorted the answers in relation to their relevance to our research questions. (3) Using sense units as basic coding units, we then coded the data filtering out certain text components. Thus, we make statements about the relative weight of these text components per frequency. (4) We paraphrased the coded sections, structured and summarized each category. To analyze our data regarding stressors as well as personal and social resources, we examined each paraphrase with regard to the definitions mentioned above (see Kuckartz, 2016; Mayring, 2015). At the beginning of the analysis, two coders coded 20% of the answers to our two open questions, respectively (see Wirtz & Caspar, 2002). In case of disagreement, clarification by discussion followed before conducting the whole analysis. We conducted the test of intercoder reliability which produced a coefficient of $rH = .80$. Thus, overall, the two independent coders evaluated the data in a similar way and reached the same conclusions (see Bos, 1989). Because no aspects were mentioned with regard to personal resources in terms of psychological capital in the open responses, the original dimensions and coding rules of psychological capital are not depicted in the results section, but in an additional table (see Table 2, Supplement). Regarding resources and relieving factors, we have inductively extracted further catego-

ries from the material and highlighted them with "additional" in each case (see Table 2; Table 1, Supplement).

*Quantitative analyses (Study 2).* Data analyses were run using SPSS (version 26.0; IBM Corp., 2019). To assess instructors' stress levels, as well as perceived stressors and resources in the first and second semester of the pandemic, at first, descriptive statistics were calculated, separated by gender and professional status (see Table 3 and 4, Supplement). In order to assess potential differences between the groups, one-way between-subjects ANOVA were conducted to compare the means of each variable of interest, separated by gender (0 = female, 1 = male) and professional status (0 = mid-level staff, 1 = professors, 2 = lecturers), for each wave, respectively. To assess potential significant mean differences between each of the professional status groups post hoc comparisons using the Tukey HSD test and the Games-Howell test were computed.

### *3.2 Participants*

157 (W1, Spring 2020) and 128 (W2, Fall/Winter 2020/21) instructors at a large German university (about 30.000 enrolled students) participated in this multi-wave survey with independent samples at each wave. At W1, 81 females, 59 males and 4 diverse instructors (n = 13 not stated) participated. At W2 78 females, 39 males and 2 diverse instructors (n = 9 not stated) participated. 89 instructors of academic mid-level staff, 38 professors and 29 associate lecturers (n = 1 not stated) participated at W1. 77 instructors of academic mid-level staff, 25 professors and 23 associate lecturers (n = 3 not stated) responded to our survey at W2. Instructors' average age was 41.54 years ($SD$ = 10.93) at W1 and 39.79 years at W2 ($SD$ = 11.83). There was a positive correlation between age and professional status [$r_{W1}(138) = .518, p = .001$]; [$r_{W2}(113) = .597, p = .001$], showing that, on average, lecturers and professors were older than mid-level staff.

### *3.3 Procedure*

Questionnaires were distributed via email with an included link to the survey program Unipark (QuestBack Ltd., 2020); participants completed the questionnaire online. Instructors were asked to describe their experiences in teaching-related and research-related activities at the end of the semester. Before starting the survey, instructors read a statement informing them about the voluntary character of the study and the anonymity of their data, and were assured that the research would be carried out following the *Guidelines for Safeguarding Good Research Practice* by the German Research Foundation (German Research Foundation (DFG), 2019).

### *3.4 Measures*

To identify potential stressors and resources in the qualitative Study 1, we included two self-developed open-ended questions in the survey. For the quantitative Study 2, several constructs were derived from existing literature identifying prominent stressors and resources, and measuring stress. Other measures were self-developed building on a study by Watermeyer et al. (2020).

#### *3.4.1 Stressors and stress*

*Open question regarding afflicting factors (Qualitative Study 1).* To identify potential stressors, at W1, we introduced an open question regarding afflicting factors during the first online semester. Respondents were asked the following open-ended question: "Which factors in the past online semester did you experience as more afflicting compared to semesters in presence?".

*Stressors: Technical challenges.* Instructors' perceived technical challenges were assessed using a self-developed scale consisting of two items (e. g., "In the last semester, I was frequently occupied with technical difficulties.") building on a study by Watermeyer et al. (2020). Both items used a 5-point Likert response scale (1 = strongly disagree, 5 = strongly agree) and were found to be internally consistent ($\alpha$ = .995 at W1; $\alpha$ = .876 at W2).

*Stressors: Teaching effort.* To assess instructors' perceived effort in remote teaching compared to the previous semesters (W1)/to the first online semester (W2) we used four items in the form of continuous visual analogue scales (e. g., "The amount of work required to prepare my courses in the online semester was ..."). At W1, respondents rated their teaching effort with remote teaching-related activities with a slider where a value of 0 implied markedly lower effort in online teaching, a value of 50 the same effort as in previous semesters and 100 markedly higher effort than in presence teaching. At W2, participants rated their teaching effort with remote teaching-related activities with a slider where 0 implied markedly lower effort than in the first online semester, 50 just as in the first online semester and 100 markedly higher effort than in the first online semester. The four items formed an acceptable scale ($\alpha$ = .594 at W1; $\alpha$ = .694 at W2).

*Stressors: Time for research.* To assess time for research activities, we developed a measure to assess the amount of time available for conducting research compared to the previous semesters (W1)/to the first online semester (W2). The scale consisted of two items (e. g., "The available amount of time for research-related activities in the online semester was ..."). At W1, instructors reported their time for research with a slider where 0 implied markedly less time for research in the online semester, 50 the same time as in previous semesters and 100 markedly more time for research activities than in presence semesters. At W2, instructors reported their time for research with a slider where 0 implied less time for research than in the first online semester, 50 the same time as in the first online semes-

ter and 100 markedly more time for research than in the first online semester. The 2-item scale was found to be internally consistent ($\alpha$ = .814 at W1; $\alpha$ = .860 at W2).

*Stress.* The extent to which situations in instructors' life during the pandemic were perceived as stressful was assessed using a well-established measure by Cohen et al. (1983) consisting of five items (e. g., "In the last month, how often have you felt nervous and 'stressed'"?). Instructors indicated their level of stress on a 5-point Likert scale (1 = never, 5 = very often), with higher values reflecting higher levels of stress. All five items formed an internally consistent scale ($\alpha$ = .818 at W1; $\alpha$ = .873 at W2).

### *3.4.2 Personal and social resources, additional relieving factors*

*Open question regarding relieving factors (Qualitative Study 1).* An open question was designed to identify personal and social resources at W1. It read "Which factors in the past online semester did you experience as relieving compared to semesters in presence?".

*Personal resources: Academic online self-efficacy.* Instructors' beliefs in their own ability to teach and motivate students online was assessed using a measure by Shen et al. (2013), adapted for higher education instructors and consisting of three items (e. g., "I think I can teach students complex concepts online."; "I can motivate students to successfully complete required online tasks to achieve competence goals."). All items had the format of a 5-point Likert response scale (1 = strongly disagree, 5 = strongly agree) and were found to form an internally consistent scale ($\alpha$ = .668 at W1; $\alpha$ = .654 at W2).

*Personal resources: Social teaching self-concept*. To create a measure tapping into instructors' perceived ability to manage interpersonal aspects in teaching, such as self-perceived accessibility, kindness, and approachability for students, but also into their own ability of considering students' perspectives and individual competences in guiding them to achieve good learning outcomes we adapted a measure by Adams and Christenson (2000), consisting of 12 items, for higher education instructors. Example items were: "I can guide my students on how to work constructively with their fellow students."; "I am easy to reach when my students have difficulties or questions."; "I am friendly and approachable."; "I am receptive to my students' input and suggestions."; "I can act in the interest of students' learning success."; (for the overall scale see Table 5 in the supplement). Instructors indicated their answers on a 5-point Likert scale (1 = strongly disagree, 5 = strongly agree), with greater values reflecting a more positive social teaching self-concept. The scale was found to be internally consistent ($\alpha$ = .897 at W1; $\alpha$ = .870 at W2).

*Personal resources: Teaching joy.* To assess instructors' teaching joy compared to the previous semesters (W1)/to the first online semester (W2) we used a self-developed measure consisting of three items (e. g., "My overall joy to conduct teaching during the online semester was ..."). At W1, respondents rated their teaching joy with a slider where 0 implied markedly lower joy in online teaching, 50 just as in previous semesters and 100 markedly

greater joy than in presence teaching. At W2, participants rated their joy of teaching with a slider where 0 implied markedly lower joy in online teaching than in the first online semester, 50 just as in the first online semester and 100 markedly greater joy than in the first online semester. The three items formed an internally consistent scale ($\alpha$ = .821 at W1; $\alpha$ = .841 at W2).

*Social resources: Cooperative climate among colleagues.* We used an adapted measure by Eder (1998) to assess instructors' perceived supportive climate among colleagues consisting of four items (e. g., "When someone in our institute needed help in dealing with technology and media, other colleagues were glad to help her/him."). All items used a 5-point Likert response scale (1 = strongly disagree, 5 = strongly agree) and the scale was found to be internally consistent ($\alpha$ = .797 at W1; $\alpha$ = .797 at W2).

*Social resources: Institutional support.* Building on the research by Watermeyer et al. (2020) we developed a scale to identify the extent to which instructors perceived their university as supportive regarding their teaching-related and research-related issues during the pandemic. The scale consisted of three items (e. g., "In the last semester, I felt very well supported by the university in planning remote teaching (e. g., through further training offers)."). All items had the form of 5-point Likert response scales (1 = strongly disagree, 5 = strongly agree); the overall scale was found to be internally consistent ($\alpha$ = .790 at W1; $\alpha$ = .811 at W2).

*Socio-demographic data.* At the very end of the questionnaire, participants were asked to provide information on their gender, age and professional status.

## 4 Results

### *4.1 Study 1: Perceived Stressors and Resources During the First Online Semester of the Pandemic*

Table 1 and 2 show the categories with their respective definitions, examples and coding rules, as well as the results in terms of the number of mentions and proportions within the total number of statements. As shown in Table 1, the most frequent utterances of academics' occupational stressors were those related to social characteristics of the workplace in the first semester of the pandemic (137 nominations). In particular, instructors highlighted the *lack of (face-to-face) communication with students and colleagues*. For example, someone reported: *There was a permanent lack of communication channels such as gestures, facial expressions, proxemics, and thus, no feedback was possible* (even from students to instructors). At the same time instructors reported to feel like *fighting against windmills when trying to involve passive students during seminars*. Instructors also reported to be stressed by students who did not turn on their cameras because it felt like *facing a black wall*. Instructors reported that this behavior by students (*not turning on microphone or*

*camera*) was associated with high levels of uncertainty regarding content transfer: *I was very insecure whether certain aspects of the text-based self-study have been understood*. Some instructors also report their *lack of ability to become aware of students' problems and to meet their needs in online learning environments*. The second highest number of mentions were stressors related to increased workload (75 nominations). Particularly burdening were *extremely much mail traffic* and the *high effort required for planning and conducting teaching*. Interestingly, regarding job control, three respondents reported *suddenly having too much autonomy* while *losing control* resulting in difficulties to find the *way to their own online format*. 32 participants did not answer to the open question and 2 wrote *no factors*.

Interestingly, as in stressors, the most frequent mentions of resources and relieving factors were related to contact and interaction with students (18 nominations). In addition to the statements listed in Table 2, one instructor reported that the *fast and immediate communication with the students during the seminar sessions via the chat function was relieving*. Another instructor stated that the new form of communication allowed students asking *even little questions that might not have been asked in a face-to-face seminar*, instructors could *refer to and guide students in much greater detail*, had *more options to provide feedback to quiet and introverted students* and that fewer students got *lost*. Three other instructors reported students' commitment as relieving, that students *were motivated*, *well-organized,* and *made the best out of it*. Another instructor stated that there was a *surprisingly high quality of prepared contributions by students*. Interestingly, there were only a few nominations related to the four dimensions of social support (House, 1981; 6 nominations in total, see Table 2). As shown in the supplementary material (Table 1), the most frequent mentions regarding relieving factors were related to three additional new categories, namely digital teaching and working, home office (and related time savings), and flexibility. For many academics, digital teaching and working (50 nominations in total) included advantages, *particularly new digital tools which made the work more efficient*. Regarding home office (35 nominations), academics perceived working at home without commuting as relieving given this allowed savings time for work. One respondent even expressed the wish to *continue home office*, stating that in the long term, *more opportunities should be created for this after the pandemic*. Some respondents appreciated the increased flexibility (18 nominations) and that they were able to manage their time freely (and in five cases very effectively). A relatively high number of respondents answered *nothing* (n = 23) or did not answer the question (n = 42).

## 4.2 Study 2: Levels of Stress, Perceived Stressors and Resources Depending on Gender, and Professional Status

The descriptive statistics for all variables at W1 and at W2 can be found in Table 3 and 4 in the supplement. Levels of stress, stressors and resources by gender, and professional status are shown in Figure 1, 2, 3, 4 and 5.

### 4.2.1 Levels of Stress and Stressors by Gender, and Professional Status

*Stress and stressors by gender.* There was no significant difference in stress levels between female and male instructors, neither at W1 nor at W2. Overall, we found no significant differences in stressors between female and male instructors at both times.

*Stress and stressors by professional status*. A one-way between-subjects ANOVA at W1 and at W2 showed significant differences in instructors' stress levels depending on their professional status [$F_{W1}(2, 150) = 3.25$, $p = .041$, partial $\eta^2 = .042$]; [$F_{W2}(2, 117) = 3.61$, $p = .030$, partial $\eta^2 = .058$]. Both at W1 and at W2, post hoc comparisons using the Tukey HSD test indicated that mid-level staff's levels of stress ($M_{W1} = 3.18$, $SD = 0.82$; $M_{W2} = 3.26$, $SD = 0.80$) were significantly higher than lecturers' levels of stress ($M_{W1} = 2.76$, $SD = 0.73$; $M_{W2} = 2.72$, $SD = 0.90$; see Figure 1).

For teaching effort, Levene's Test for Equality of Variances identified unequal variances between the professional status groups at W2. We thus conducted a Welch's ANOVA and found a significant difference in instructors' teaching effort depending on their professional status [$F_{W2}(2, 48.43) = 5.39$, $p = .008$, $\omega^2 = .064$]. Post hoc comparisons using the Games-Howell test indicated that professors reported significantly higher teaching effort ($M = 66.53$, $SD = 14.98$) than lecturers ($M = 54.21$, $SD = 8.86$; see Figure 2).

### 4.2.2 Levels of Personal and Social Resources by Gender, and Professional Status

*Personal and social resources by gender.* A one-way between-subjects ANOVA at W1 and at W2 showed significant differences in levels of instructors' social teaching self-concept depending on their gender [$F_{W1}(1, 134) = 10.23$, $p = .002$, partial $\eta^2 = .071$]; [$F_{W2}(1, 113) = 6.13$, $p = .015$, partial $\eta^2 = .051$; see Figure 4] with female instructors reporting more positive social teaching self-concepts than male instructors. We also found significant gender differences in perceived institutional support [$F_{W1}(1, 137) = 3.90$, $p = .050$, partial $\eta^2 = .028$]; [$F_{W2}(1, 113) = 5.34$, $p = .023$, partial $\eta^2 = .045$; see Figure 5] with women reporting higher institutional support than men.

*Personal and social resources by professional status.* At W2, a one-way between-subjects ANOVA showed significant differences in instructors' levels of academic online self-efficacy depending on their professional status [$F_{W2}(2, 120) = 5.57$, $p = .005$, partial $\eta^2 = .085$]. Post hoc comparisons using Tukey's HSD test indicated higher levels of academic online self-efficacy for mid-level staff ($M = 4.12$, $SD = 0.54$) than for professors ($M =$

3.68, *SD* = 0.67; see Figure 3). Also, at W2, a one-way between-subjects ANOVA showed significant differences in instructors' levels of institutional support [$F_{W2}(2, 117) = 4.80$, $p = .010$, partial $\eta^2 = .076$]. Post hoc comparisons using the Tukey HSD test indicated that professors perceived lower levels of institutional support (*M* = 2.59, *SD* = 1.09) than mid-level staff (*M* = 3.04, *SD* = 0.87) and lecturers (*M* = 3.35, *SD* = 0.92; see Figure 4 and 5).

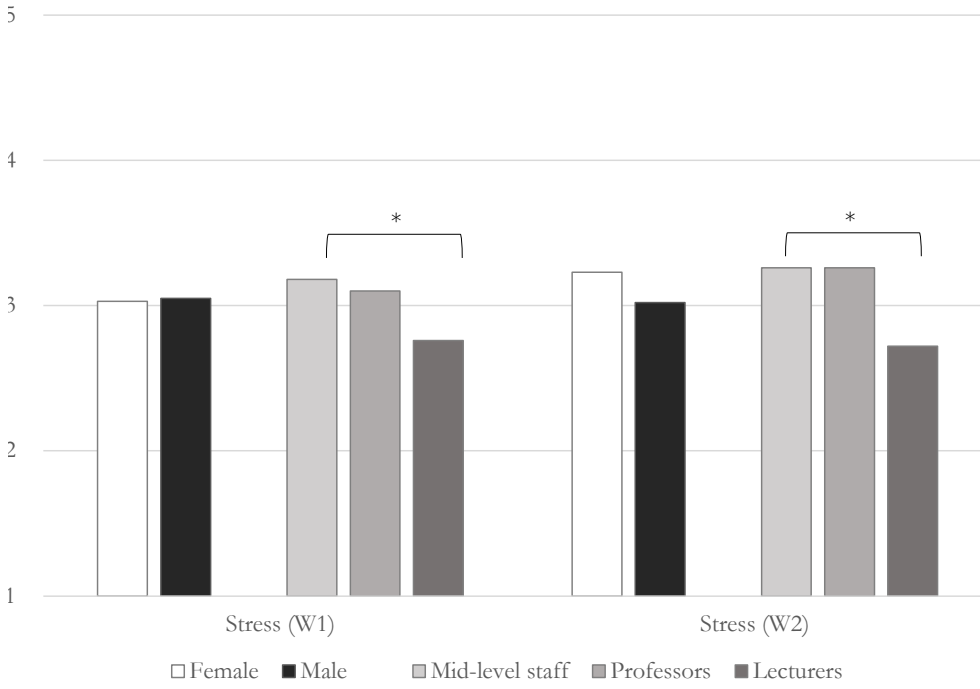


Figure 1: Levels of stress by gender, and professional status at W1 and W2
Note: Gender: 0 = female, 1 = male; Professional status: 0 = mid-level staff, 1 = professors, 2 = lecturers. Gender: W1: 0 = 80, 1 = 59; W2: 0 = 77, 1 = 38; Professional status: W1: 0 = 88, 1 = 36, 2 = 29; W2: 0 = 76, 1 = 23, 2 = 21. *$p \leq 0.05$. **$p \leq 0.01$. ***$p \leq 0.001$.

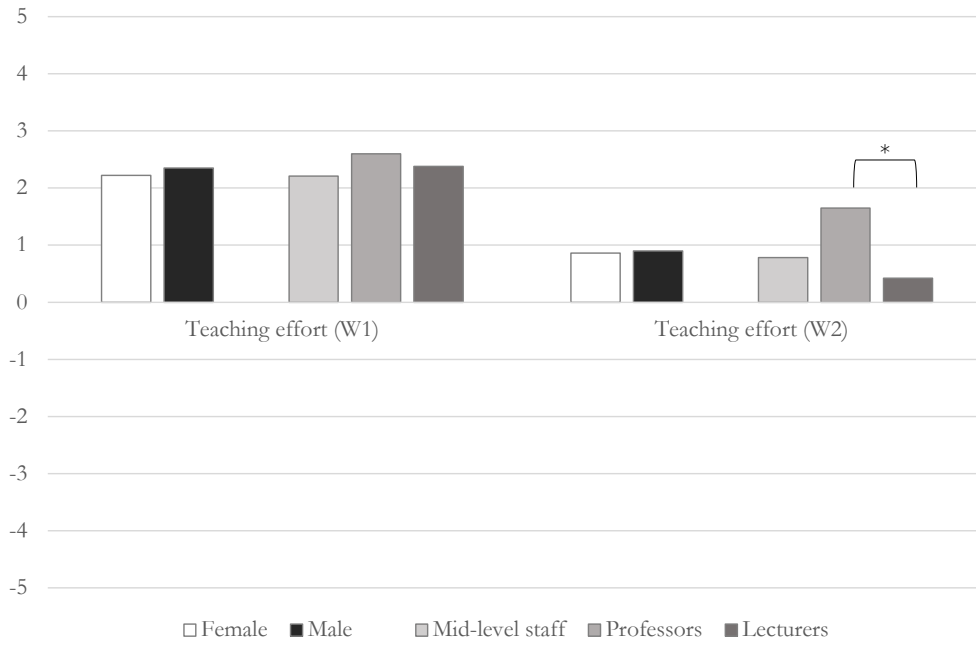


Figure 2: Stressors: Levels of teaching effort by gender, and professional status at W1 and W2
Note: Gender: 0 = female, 1 = male; Professional status: 0 = mid-level staff, 1 = professors, 2 = lecturers. Gender: W1: 0 = 80, 1 = 57; W2: 0 = 70, 1 = 36; Professional status: W1: 0 = 87, 1 = 36, 2 = 28; W2: 0 = 69, 1 = 23, 2 = 19. $^{*}p \leq 0.05$. $^{**}p \leq 0.01$. $^{***}p \leq 0.001$.
The value 50 represents the middle of the continuous visual analogue scale and thus the same effort in online teaching as in previous semesters in presence (W1) or as in the first online semester (W2). To ensure clarity, the value 50 was subtracted from each of the indicated values (original scale: values 0–100) and then divided by 10.

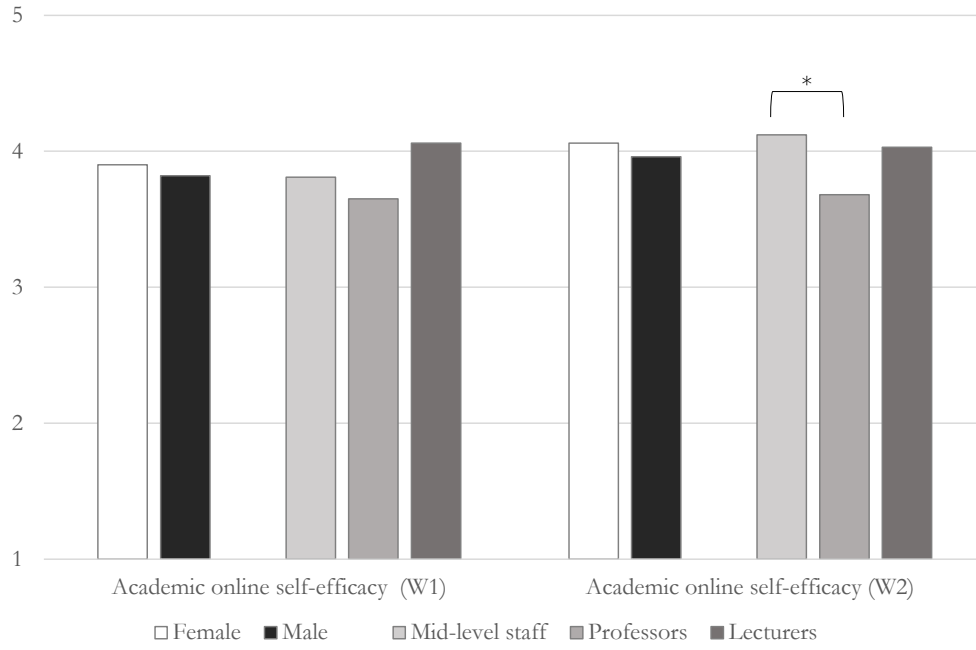


Figure 3: Personal resources: Levels of academic online self-efficacy by gender, and professional status at W1 and W2

Note: Gender: 0 = female, 1 = male; Professional status: 0 = mid-level staff, 1 = professors, 2 = lecturers. Gender: W1: 0 = 79, 1 = 58; W2: 0 = 78, 1 = 38; Professional status: W1: 0 = 88, 1 = 36, 2 = 28; W2: 0 = 77, 1 = 24, 2 = 22. $^{*}p \leq 0.05$. $^{**}p \leq 0.01$. $^{***}p \leq 0.001$.

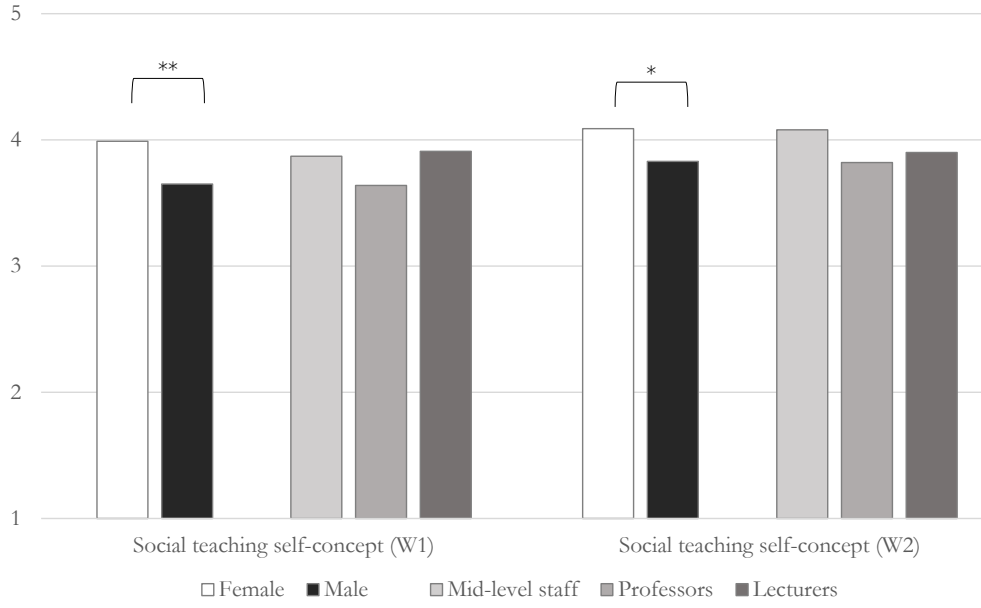


Figure 4: Personal resources: Levels of social teaching self-concept by gender, and professional status at W1 and W2
Note: Gender: 0 = female, 1 = male; Professional status: 0 = mid-level staff, 1 = professors, 2 = lecturers. Gender: W1: 0 = 79, 1 = 57; W2: 0 = 77, 1 = 38; Professional status: W1: 0 = 87, 1 = 35, 2 = 28; W2: 0 = 76, 1 = 23, 2 = 21. $^{*}p \leq 0.05$. $^{**}p \leq 0.01$. $^{***}p \leq 0.001$.

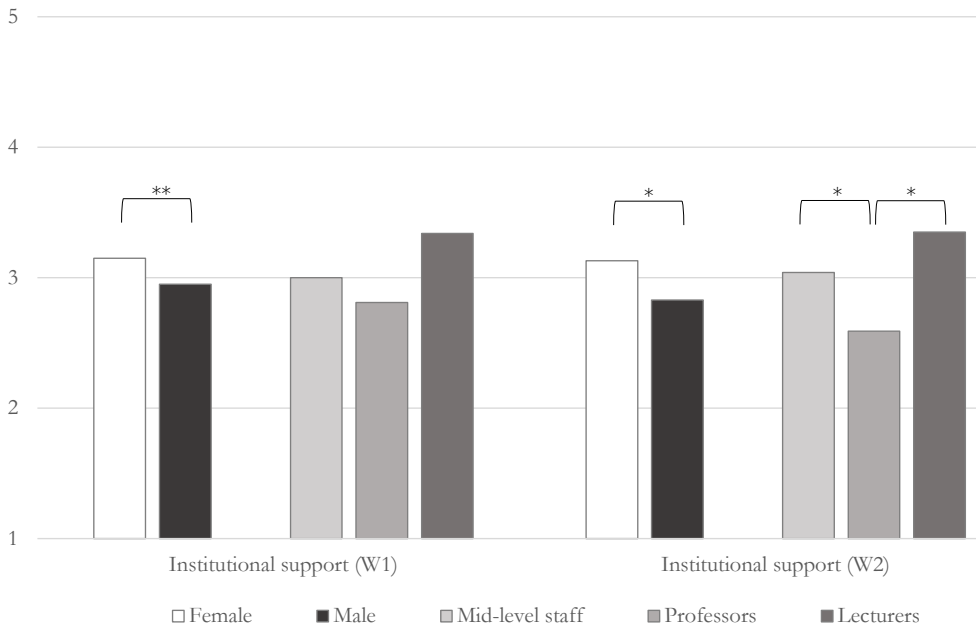


Figure 5: Social resources: Levels of institutional support by gender, and professional status at W1 and W2

Note: Gender: 0 = female, 1 = male; Professional status: 0 = mid-level staff, 1 = professors, 2 = lecturers. Gender: W1: 0 = 81, 1 = 58; W2: 0 = 77, 1 = 38; Professional status: W1: 0 = 87, 1 = 37, 2 = 28; W2: 0 = 76, 1 = 23, 2 = 21. $^{*}p \leq 0.05$. $^{**}p \leq 0.01$. $^{***}p \leq 0.001$.

Table 1: Stressors perceived by instructors at W1, including number of mentions and proportions within the total number of statements[2]

| Category | Definition | Examples *(verbatim)* | Coding rules | *N* (%) |
|---|---|---|---|---|
| 1) Work Role Stressors | Uncertainty about role expectations; Incompatibility of role expectations; Role expectations exceed resources or time available | *The additional supervision of students and technical efforts; Instructors were administrators of study affairs* | Different work factors are perceived as conflicting (sense units) | 3 (1.0%) |
| 2) Workload | Objective information and subjective perceptions; Quantitative workload (i. e., the amount of work) and qualitative workload (i. e., difficulty of tasks) | *There is a significantly increased effort in preparation and follow-up in teaching; Keeping track is exhausting and drained me out* | All (also newly evolved) work elements related to teaching and research and perceived as an effort (sense units) | 75 (25.6%) |
| 3) Situational Constraints | Organizational factors such as bureaucracy, faculty equipment or inaccurate given information | *There were new technical requirements (such as shoot and edit videos), uncertain technical conditions and increased screen time with no frame of reference of what works; The changeover without assistance, guidance or communication by the university; Frequent uncertainties and changes in processes* | All aspects related to direct burdens resulting from the new situation, but also indirectly reflect management practices of the respective institute or university (sense units) | 32 (10.9%) |
| 4) Job Control | Little autonomy given; Feelings of being excluded from decision-making processes | - | Other instances such as the supervisor, the institute or the presidium are mentioned related to a lack of respondents' autonomy (sense units) | 0 (0%) |

2 Note: For the definitions see Rosen et al. (2010). The overall number of mentions were 293 (including missing values and the answer *no factors*).

| | | | | |
|---|---|---|---|---|
| 5) Social Characteristics of the Workplace | Interpersonal conflict; Organizational politics | *No (face-to-face) communication with students; There were no nonverbal cues; I was facing a black wall; Fighting against windmills when trying to involve passive students during seminars; No feedback from students; Students could opt out whenever they wanted; Insecurity about how the seminar content will be received by the students; Students are more easily distracted from work at home; Limited exchange with colleagues* | All elements related to conflicts in interpersonal contact and communication and feelings of not being valued by students and by the workplace (sense units) | 137 (46.7%) |
| 6) Career-Related Norms | Job insecurity; Lack of learning or advancement opportunities; Work interference with nonwork domains (e. g., family). | *Managing child and work in the same space; Triple burden (job, household, children); Lack of time for research* | All aspects related to job insecurity, career advancement, research-related burdens and the management of competing demands of career and family life (sense units) | 5 (1.7%) |
| 7) Job Conditions | Physical dimensions (e. g., temperature); Nature of job tasks (e. g., emotional labour); Design of how tasks must be performed (e. g., break schedule, work hours, shift work) | *Unstable tools, weak internet, and thus constant disconnects; Compliance with hygiene regulations and requirements related to exams; Significantly more work on the computer (while sitting); Disinfecting and the break between runs needed in seminars or exams* | Work conditions related to the nature of online teaching and conducting research during the pandemic (sense units) | 7 (2.3%) |

Table 2: Social resources perceived by instructors at W1, including number of mentions and proportions within the total number of statements[3]

| Category | Definition | Examples *(verbatim)* | Coding rules | N (%) |
|---|---|---|---|---|
| 1) Emotional support | Receiving empathy, caring, love, trust, esteem, concern, and listening from others | - | When emotional support is mentioned and/or all aspects related to the definition (sense units) | 0 |
| 2) Instrumental support | Receiving aid in kind, money, labor, time, or any direct help | *A lot of honest collegial exchange and mutual solidarity emergency assistance; More technical support* | When instrumental support is mentioned and/or all aspects related to the definition (sense units) | 2 (1.0%) |
| 3) Informational support | Receiving advice, suggestions, directives, and information for use in coping with personal and environmental problems | *The responsiveness of all services of the university were excellent; The online service employees were competent and flexible and I always received a friendly and constructive answer* | When informational support is mentioned and/or all aspects related to the definition (sense units) | 2 (1.0%) |
| 4) Appraisal support | Receiving affirmation, feedback, social comparison, and self-evaluation | *Very open and extensive feedback from students* | When appraisal support is mentioned and/or all aspects related to the definition (sense units) | 2 (1.0%) |

3 Note: For the definitions see House (1981). Additional categories were added during the analysis, highlighted by "additional". The overall number of mentions were 193 (including missing values and the answer *nothing*).

| | | | | |
|---|---|---|---|---|
| 5) Contact and interaction with students (additional) | Meeting and communicating with students online | *I had more personal contact with the students who had actively participated; Students' understanding that we all have to adapt to circumstances and find our way around the situation; Students could watch videos of online seminars as many times as they wanted and I got asked fewer questions and had to explain less; Students' time commitment and punctuality who had to prepare for each topic/session and thus learned more than usual; Students worked a lot independently* | When contact and interaction with students are mentioned and/or all aspects related to the definition (sense units) | 18 (9.3%) |
| 6) Colleagues' and supervisors' behavior (additional) | Colleagues' and supervisors' activities, including objectively observable activities, introspectively observable activities and nonconscious processes | *My supervisor gave us employees a lot of freedom* | When colleagues' and supervisors' behavior are mentioned and/or all aspects related to the definition (sense units) | 1 (0.5%) |

## 5 Discussion and Conclusion

With the beginning of the pandemic, instructors in higher education have been facing the task to suddenly perform all teaching and advisory activities in online contexts while simultaneously struggling with the intense personal restrictions imposed by the spread of COVID-19. In the present paper we sought to take a closer look at university instructors' experiences during the first two semesters in the pandemic. Its purpose was fourfold: We aimed to provide detailed insights into a) aspects that instructors found particularly stressful, b) instructors' overall levels of stress and stressors one and two semesters into the pandemic, c) aspects that instructors described as personal and social resources, and d) instructors' overall levels of personal and social resources they could fall back on to cope with stress in the pandemic. To reach these goals we performed two studies: a qualitative content analysis in which we examined instructors' written statements about perceived stressors and resources during the first pandemic semester (Study 1) and a quantitative study in which we analyzed instructors' stress, stressors, and resources in two independent waves considering their gender and professional status (Study 2). Our studies show that while the perception of stress is a highly individualized process contingent on objective environmental demands, subjectively experienced stressors, and perceived resources, there are overall differences in perceived stress, stressors, and resources for female and male instructors but also for instructors in different professional groups (i. e., mid-level staff, professors, lecturers).

**Perceived Stressors: (the Lack of) Social Relations and Communication as Linchpin**

A central finding of our analyses is the accentuated role of social factors in instructors' experiences. When asked about factors experienced as more afflicting compared to semesters in presence during the first remote teaching semester, instructors frequently mentioned aspects related to communication, social interaction, and social support – many of which were strongly related to teaching and interaction with students such as the lack of *(face-to-face) communication with students; There were no nonverbal cues; I was facing a black wall; Fighting against windmills when trying to involve passive students during seminars; No feedback from students; Students could opt out whenever they wanted; Insecurity about how the seminar content will be received by the students* while some related to *limited exchange with colleagues*. Interestingly, as in stressors, when asked about factors experienced as more relieving compared to semesters in presence during the first remote teaching semester, the most frequent mentions were related to contact and interaction with students.

Very broadly, the remarks related to perceived stressors describe the lack of social support (see Jolly et al., 2021) and contact. Previous research has found that the psychological and physiological effects of such experiences can be profound. For example, in a study by Taylor and colleagues (2010), participants were contacted several times a day over the course of 9 days. In every contact, they were asked to indicate the level of perceived social support

in their last interaction. Following this, brains were scanned while participants were engaging in several tasks. For example, participants underwent the Trier Social Stress Test (TSST) in which they had to deliver a speech to different types of audiences (for example to an unresponsive audience - a situation quite similar to giving a synchronous online lecture with students having their cameras turned off). The researchers found that in a negative audience condition (negative feedback from the audience), social resources facilitated cortisol recovery which highlights the buffering role of social resources in stressful situations. This should be kept in mind when designing the digital transformation in higher education. The teaching situation in digital environments should be set up in such a way that social support is mutual – a task of both instructors and students – allowing resonance, feedback, engagement, and commitment. This may include the ex-ante provision of institutionally supported class participation agreements. Teaching and learning crucially depends on interaction and identification of learning progress and active participation – in highly interactive courses and semesters this necessitates some form of non-verbal cues for both students and instructors alike. This is of particular relevance for students studying to become teachers, who – at least in Germany – constitute a large share of a university's student body. Interactions between higher education instructors and students may further include possibilities for instructors to support students' opportunities to interact with each other (see Elmer et al., 2020) and with instructors in informal social settings, e. g., by organizing online events at the beginning of the semester.

The possibilities for interaction in informal settings may relate positively to various students' learning and performance-related outcomes. For instance, current research found that higher education students' reported lack of interaction with other students during the pandemic was negatively related to motivation for learning and performance (e. g., Krammer et al., 2020). This, in turn, could negatively affect the digital classroom climate (for general classroom climate see Lerdpornkulrat et al., 2018). "Investing" in these social relations at the beginning of the semester can facilitate classroom activities and interaction throughout the semesters by involving peers as co-teachers and sources of academic and emotional support. Our findings also support universities' efforts to sustain a critical share of teaching and exchange in presence and installing new forms of digital and remote teaching in higher education as an essential but complementary element to in-class teaching (see Han & Ellis, 2019).

*A gendered view on instructors' stress, stressors, and resources during the pandemic?*

As several theoretical models underscore, negative stressors are expected to occur when a situation is perceived as *too* demanding or threatening for prolonged time periods, i. e., when people believe that they lack the resources needed to cope with the situation. Numerous studies identified gender differences in stress experiences. For example, in a sample of 2816 between 18- and 65-years old men and women, Matud (2004) found that women scored significantly higher in chronic stress and minor daily stressors than men.

In our quantitative study we did not find any differences in perceived stress and stressors. This is particularly notable given the scale we used measured generalized levels rather than occupational levels of stress. How can this be explained? One possible account is that during these semesters female instructors have been more efficient in soliciting adaptive social support (for gender differences in social support during challenges e. g., Neff & Karney, 2005) and subjectively more successful in creating positive relationships to their students. For example, we found that female instructors not only reported significantly higher levels of institutional support than their male colleagues, but also reported markedly higher social teaching self-concepts. Because there was no gender difference in perceived exchange climate among colleagues in the respective institutes, we think that it was rather institutional support and perceived relationship to students that worked as relieving factors.

Clearly, more research is needed to ascertain the actual impact of these factors on instructors' levels of perceived stress. Further, future studies may wish to specify subdimensions of institutional support (including e. g., the provision of platforms for exchange, allocable technical support desks, well-organized teaching resources, or child care). Surveys conducted during the pandemic suggested gendered COVID-19 faculty experiences (e. g., Stanford COVID-19 Faculty Survey, O'Connell et al., 2020) with conditions being particularly adversely for women with children. Studies have found that female academics compared to their male colleagues have been more strongly involved in activities less valued by an academic system emphasizing productivity in terms of publications or research grants (see Kasymova et al., 2021; Morgan et al., 2021). Already before the pandemic, female scientists have been shown to put more effort in teaching, mentoring, and responding to the needs of (disadvantaged) students (Gibney, 2017) and faculty service loads (Guarino & Borden, 2017). While this has led to the well-documented productivity penalty, particularly for women with children (Morgan et al., 2021), the extra-effort in creating and maintaining these positive relationships may be responsible for the positive social teaching self-concept, a psychosocial resource we found to be significantly higher among female instructors at both waves. At this point it should be noted that our results are based on the responses of only those instructors that found the time to participate in our survey during the pandemic. Thus, it is well possible that our study underestimates the levels of stress among male and female faculty (particularly those with child care responsibilities) in the first two semesters of the pandemic.

*The role of professional status for perceived stress, stressors, and resources*

In the first and second semester of the pandemic, mid-level staff reported significantly higher levels of stress than lecturers. Although our data does not allow to explore the reasons for this difference more thoroughly, it seems plausible that different role expectations may be responsible for the higher stress levels among mid-level staff. Particularly, in addition to teaching, mid-level staff are usually involved in their dissertation projects and

other research projects while feeling a strong responsibility to be approachable for students as instructors. Possibly, the management of these different work roles was perceived as particularly stressful during the pandemic. The difference could also be strengthened by fixed-term employment contracts of mid-level staff. Yet, this information is not available in our survey and should be considered in future research.

Interestingly, mid-level staff reported higher levels of academic online self-efficacy compared to professors during the second semester in the pandemic. This suggests that mid-level staff has been able to gain competences in handling digital teaching formats. On the other hand, professors reported significantly lower levels of institutional support than mid-level staff. Although our data does not allow us to draw inferences about causal relationships, it seems plausible that professors had higher expectations regarding the support they would obtain from their institution. Future research might want to investigate the specific situation of the particular resources and stressors for early-, mid-, and late career instructors, accounting for gender, contract, and the impact of parenthood. Such research will be important in helping university and faculty management to provide target group specific support that will help academics to attain the productivity they are striving for.

### *5.1 Conclusion*

It has been long known that social factors are profoundly related to individuals' stress experiences. There have been abundant studies investigating these relations in a wide variety of samples with university students being a particularly well examined group. Yet, few studies so far have been addressing the situation of instructors. In this paper we briefly reviewed existent theoretical and empirical research regarding stress, stressors, and personal as well as social resources. We further offered unpublished data underscoring the important role of social factors as both poison and cure in the challenging times of the incipient pandemic.

By forcing all instructors to rapidly transform their teaching activities into online learning formats, the pandemic drastically accelerated higher educations' digital transformation. With the results presented here we hope to show that when trying to reduce the cost of rapid adaptions to such grave transformations institutions have to take these social factors seriously. University and faculty management can importantly contribute by providing instructors with helpful structures to support their self-organization and exchange, by creating a culture in which collegial support and close exchange with students is genuinely valued, and by co-creating functional (digital) infrastructure in which instructors can voice needs and exchange support to cope with uncertain future challenges.

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## Supplement

Table 1: Additional relieving factors perceived by instructors at W1, including number of mentions and proportions within the total number of statements

| Category | Definition | Examples *(verbatim)* | Coding rules | *N* (%) |
|---|---|---|---|---|
| 1) Digital teaching and working (additional) | Teaching and working material are provided and exchanged digitally synchronously and/or asynchronously and all teaching-related and work-related meetings take place digitally synchronously and/or asynchronously | *Creative development of instructional videos: precise control over one's own word selection and presentation; Videos allow a fixed point of reference and an assurance of results that gives students security and can be self-relieving; I have been forced to learn and use some new digital helpful tools of our university learning platform (e. g., automated online exams); Meetings (faculty, institute, committees) were more efficient online (but less personal)* | When digital teaching and working are mentioned and/or all elements related to digital teaching and working (sense units) | 50 (25,9%) |
| 2) Home office (and related time savings) (additional) | Working at home (teaching-related and research-related work) and time savings because of home office | *No commuting; no travelling; No time loss while travelling; No hectic changes of location for meeting appointments* | When home-office and/or time-savings are mentioned and all elements related to this (sense units) | 35 (18,1%) |
| 3) Flexibility (additional) | Possibilities of autonomous free availability of time and content | *Unbound to weekly time slots in asynchronous phases; I have never been able to manage my time so effectively and freely* | When flexibility is mentioned and all elements related to flexibility in terms of time and content (sense units) | 18 (9,3%) |

Table 2: Categories, definitions and coding rules regarding potential personal resources at W1 based on psychological capital (no instructors' statements in the material regarding these categories)[4]

| Category | Definition | Coding rules | *N* (%) |
|---|---|---|---|
| 1) Hope | The drive to achieve one's goals by a sense of agency, which provides someone with a determination and willpower to invest the energy necessary to accomplish his or her goals | When hope is mentioned and all statements related to a drive to cope with the challenges due to the pandemic (sense units) | 0 (0%) |
| 2) Self-Efficacy | One's confidence in his or her ability to mobilize the motivation, cognitive resources, and courses of action necessary to execute a specific course of action within a given context | When self-efficacy is mentioned and all mentions with regard to one's confidence in perform the necessary actions in teaching and research during the pandemic (sense units) | 0 (0%) |
| 3) Resilience | The use of individual and environmental protective mechanisms to operate through enhancing the assets and/or reducing risk factors within a situation for individuals or their environment | When resilience is mentioned and all factors related to self-related protecting mechanisms described by instructors (sense units) | 0 (0%) |
| 4) Optimism | Attributing adverse events in a positive way and thus changing feelings to be more hopeful | When optimism is mentioned and all statements related to instructors' positive attributions about current challenges (sense units) | 0 (0%) |

4 Note: For definitions see Bandura, 1977; 1982; Masten, 1990; 2001; Seligman, 1990; Snyder, 1994.

Table 3: Means and standard deviations of stress and stressors in total and separated by gender, and professional status at W1 and W2

| Characteristic | | Stress W1 | Technical challenges W1 | Teaching effort W1 | Time for research W1 | | Stress W2 | Technical challenges W2 | Teaching effort W2 | Time for research W2 |
|---|---|---|---|---|---|---|---|---|---|---|
| | *N* | *M (SD)* | *M (SD)* | *M (SD)* | *M (SD)* | *N* | *M (SD)* | *M (SD)* | *M (SD)* | *M (SD)* |
| Gender | | | | | | | | | | |
| Female | 81 | 3.03 (0.78) | 3.08 (1.08) | 72.25 (13.60) | 28.72 (19.46) | 78 | 3.23 (0.83) | 2.41 (1.04) | 58.64 (15.54) | 42.39 (19.31) |
| Male | 59 | 3.05 (0.83) | 3.07 (1.09) | 73.54 (14.10) | 31.12 (15.49) | 39 | 3.02 (0.89) | 2.18 (1.01) | 58.98 (16.89) | 38.39 (20.76) |
| Diverse | 4 | 4.00 (0.61) | 4.38 (0.48) | 75.06 (3.48) | 8.88 (1.31) | 2 | 4.38 (0.18) | 5.00 (0.00) | 64.50 (18.74) | 26.00 (10.61) |
| Professional Status | | | | | | | | | | |
| Mid-level staff | 89 | 3.18 (0.82) | 3.05 (1.04) | 72.13 (13.20) | 28.34 (18.50) | 77 | 3.26 (0.80) | 2.21 (0.99) | 57.81 (16.99) | 44.53 (18.18) |
| Professors | 38 | 3.10 (0.74) | 3.54 (1.07) | 76.00 (14.17) | 24.77 (16.73) | 25 | 3.26 (0.89) | 2.67 (1.17) | 66.53 (14.98) | 30.81 (20.02) |
| Lecturers | 29 | 2.76 (0.73) | 2.92 (1.17) | 73.81 (13.14) | 33.08 (18.50) | 23 | 2.72 (0.90) | 2.45 (1.09) | 54.21 (8.86) | 41.13 (18.38) |
| Total | 157 | 3.08 (0.80) | 3.14 (1.09) | 73.37 (13.43) | 28.43 (18.18) | 128 | 3.17 (0.85) | 2.37 (1.07) | 59.14 (15.79) | 40.61 (19.47) |

Note: Gender: W1: $n = 13$ not stated, W2: $n = 9$ not stated; 2. Professional status: W1: $n = 1$ not stated; W2: $n = 3$ not stated.

Table 4: Means and standard deviations of the personal and social resources in total and separated by gender, and professional status at W1 and W2

| Characteristic | | Academic online self-efficacy W1 | Social teaching self-concept W1 | Teaching joy W1 | Climate among colleagues W1 | Institutional support W1 | | Academic online self-efficacy W2 | Teaching self-concept W2 | Teaching joy W2 | Climate among colleagues W2 | Institutional support W2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *N* | *M (SD)* | *M (SD)* | *M (SD)* | *M (SD)* | *M (SD)* | N | M (SD) | M (SD) | M (SD) | M (SD) | M (SD) |
| Gender | | | | | | | | | | | | |
| Female | 81 | 3.90 (0.69) | 3.99 (0.58) | 41.04 (14.92) | 3.38 (0.83) | 3.15 (0.99) | 78 | 4.06 (0.52) | 4.09 (0.46) | 55.40 (19.50) | 3.26 (0.86) | 3.13 (0.86) |
| Male | 59 | 3.82 (0.73) | 3.65 (0.66) | 36.52 (18.26) | 3.47 (0.92) | 2.95 (1.00) | 39 | 3.96 (0.67) | 3.83 (0.62) | 50.63 (13.93) | 3.26 (0.92) | 2.83 (1.02) |
| Diverse | 4 | 3.25 (0.69) | 3.94 (0.39) | 33.08 (24.64) | 3.13 (1.18) | 1.67 (0.38) | 2 | 3.33 (0.47) | 3.20 (0.41) | 17.50 (11.55) | 2.13 (1.24) | 2.33 (0.94) |
| Professional Status | | | | | | | | | | | | |
| Mid-level staff | 89 | 3.81 (0.67) | 3.87 (0.65) | 38.63 (17.27) | 3.41 (0.83) | 3.00 (1.00) | 77 | 4.12 (0.54) | 4.08 (0.44) | 57.20 (18.81) | 3.27 (0.89) | 3.04 (0.87) |
| Professors | 38 | 3.65 (0.77) | 3.64 (0.63) | 35.69 (16.02) | 3.49 (1.01) | 2.81 (1.05) | 25 | 3.68 (0.67) | 3.82 (0.68) | 47.87 (18.94) | 2.90 (0.92) | 2.59 (1.09) |
| Lecturers | 29 | 4.06 (0.83) | 3.91 (0.78) | 45.68 (14.71) | 3.32 (0.75) | 3.34 (0.92) | 23 | 4.03 (0.54) | 3.90 (0.63) | 48.06 (13.23) | 3.42 (0.77) | 3.35 (0.92) |
| **Total** | 157 | 3.82 (0.73) | 3.82 (0.68) | 39.28 (16.76) | 3.41 (0.86) | 3.01 (1.01) | 128 | 4.00 (0.62) | 4.00 (0.53) | 53.63 (18.39) | 3.23 (0.88) | 3.00 (0.94) |

Note: Gender: W1: $n = 13$ not stated, W2: $n = 9$ not stated; 2. Professional status: W1: $n = 1$ not stated; W2: $n = 3$ not stated.

Table 5: Items of the scale of instructors' social teaching self-concept used in our study 2

| Items of the German version adapted for higher education context | Items of the English version adapted for higher education context | Original items |
|---|---|---|
| Ich bin sicher, dass ich... | I am confident that... | I am confident that teachers... |
| ... meinen Studierenden die Lehrinhalte meines Faches vermitteln kann. | ... I can teach my students the academic contents of my subject. | ... are doing a good job teaching my child academic subjects. |
| ... meine Studierenden anleiten kann, sodass sie gute Lernergebnisse erreichen können. | ... I can guide my students so that they can achieve good learning outcomes. | - |
| ... meinen Studierenden Anleitung für die konstruktive Zusammenarbeit mit ihren Kommilitoninnen und Kommilitonen geben kann. | ... I can guide my students on how to work constructively with their fellow students. | ... are doing a good job helping my child resolve conflicts with peers. |
| ... meine Studierenden gut informiert über ihre Lernfortschritte halten kann. | ... I can keep my students well-informed of their learning progress. | ... are doing a good job keeping me well-informed of my child's progress. |
| ... für meine Studierenden gut erreichbar bin, wenn sie Schwierigkeiten oder Fragen haben. | ... I am easy to reach when my students have difficulties or questions. | ... are easy to reach when I have a problem or question. |
| ... meinen Studierenden alle Informationen zugänglich machen kann, die sie für den erfolgreichen Besuch der Veranstaltung benötigen. | ... I can keep my students aware of all the information they need to successfully attend the course. | ... keep me aware of all the information I need related to school. |
| ... die Perspektive der Studierenden und deren Wohlbefinden im Blick behalten kann. | ... I can keep in mind students' perspectives and well-being. | ... are doing a good job encouraging my child's sense of self-esteem.<br>... care about my child. |
| ... den Studierenden eine positive Einstellung zum Lernen vermitteln kann. | ... I can encourage my students to have a positive attitude toward learning. | ... are doing a good job encouraging my child to have a positive attitude toward learning. |
| ... freundlich und nahbar bin. | ... I am friendly and approachable. | ... are friendly and approachable. |
| ... offen für Anregungen und Vorschläge meiner Studierenden bin. | ... I am receptive to my students' input and suggestions. | ... are receptive to my input and suggestions. |

| | | |
|---|---|---|
| ... die individuellen Kompetenzen der Studierenden wahrnehmen kann. | ... I can perceive students' individual competences. | - |
| ... im Sinne des Lernerfolgs der Studierenden handeln kann. | ... I can act in the interest of students' learning success. | ... have my child's best interests at heart.<br>... will do what is best for my child in the classroom. |

*Note:* Items not adapted: I am confident that teachers...

... are doing a good job encouraging my participation in my child's education

... are doing a good job disciplining my child.

... are doing a good job helping my child understand his/her moral and ethical responsibilities.

... are sensitive to cultural differences.

... respect me as a competent parent.

... are worthy of my respect.