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Das Praktische Jahr: eine qualitative Studie zu Stressoren, Ressourcen und Lösungsvorschlägen unter Medizinstudierenden

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„Das Praktische Jahr: eine qualitative Studie zu Stressoren, Ressourcen und Lösungsvorschlägen unter Medizinstudierenden“

Hintergrund

In der Population der Medizinstudierenden und Assistenzärzt*innen wurden bereits zentrale Stressoren wie Prüfungen und Zeitdruck ermittelt. Zu den identifizierten psychosozialen Ressourcen gehört die soziale Unterstützung durch Familie, Freunde und Kommiliton*innen. Medizinstudierende haben in früheren Studien auch Verbesserungsvorschläge gemacht, wie etwa mehr Informationen über die psychosozialen Beratungsdienste der Universität. Das letzte Studienjahr an den medizinischen Fakultäten in Deutschland ist das so genannte Praktische Jahr (PJ), das eine Kombination aus Studium und klinischer Ausbildung am Arbeitsplatz darstellt. Das PJ dient dazu, die im Studium erlernten Fähigkeiten, Fertigkeiten und Kompetenzen zu vertiefen und in die Arbeit einer angehenden Ärzt*in einzutauchen. Auf der Grundlage der bisherigen Forschungsergebnisse unter Medizinstudierenden, kann davon ausgegangen werden, dass PJ-Studierende ebenfalls ein hohes Maß an Stress erleben und auf verschiedene Ressourcen zurückgreifen. Allerdings ist die Datenlage sowohl für Medizinstudierende im Praktischen Jahr in Deutschland als auch in anderen Ländern spärlich. Das vorliegende Promotionsprojekt soll die Stressoren, Ressourcen und Lösungsvorschläge der Medizinstudierenden im PJ identifizieren.

Methoden

25 Studierende des Praktischen Jahres an einer deutschen Medizinischen Fakultät (HHU) wurden aus einer WhatsApp-Gruppe mit dem Namen "PJ - Herbst 2022" rekrutiert. Es wurden halb-strukturierte qualitative Interviews per Telefon geführt. Die Interviews wurden bis zur inhaltlichen Sättigung geführt. Die Interviews wurden aufgezeichnet, wortwörtlich transkribiert und mit der Software MAXQDA (2020) inhaltsanalytisch ausgewertet.

Ergebnisse

Achtzehn weibliche und sieben männliche Teilnehmende (n = 25; Durchschnittsalter: 26,6 Jahre; Standardabweichung (SD = 3,7)) wurden befragt (durchschnittliche Dauer = 36 Minuten (SD = 7,6). Zu den genannten wahrgenommenen Stressoren gehörten fehlende Fähigkeiten und Kenntnisse, mangelhafte Betreuung (d.h. fehlendes Interesse am Lernerfolg, fehlende feste Ansprechpartner, Zeitmangel bei der Einarbeitung), Routineaufgaben (d.h. fehlender Lernzuwachs durch repetitive Arbeiten), mangelnde Wertschätzung (hauptsächlich von Seiten der Vorgesetzt*innen) und eine hohe Arbeitsbelastung. Als Ressourcen wurden die Arbeit mit Patient*innen und deren Wertschätzung, eine positive Lern- und Arbeitsatmosphäre auf den Stationen, Lern- und Wissenserwerb, Einzelsupervision durch ärztliche Kolleg*innen, die klinisch-praktische Ausbildung sowie eine positive Work-Life-Balance mit ausreichend Freizeit genannt. Die PJ-Studierenden schlugen unter anderem eine bessere Bezahlung und eine Änderung der Fehlzeitenregelung vor sowie die Möglichkeit, sich um eigene Patient*innen zu kümmern und einen strukturierten PJ-Unterricht zu haben.

Schlussfolgerung

Die PJ-Studierenden nahmen mehrere Stressoren, aber auch Ressourcen wahr und schlugen Verbesserungsmöglichkeiten vor, wie z. B. die Organisation und Struktur des PJ, die Lehre und Supervision sowie die finanzielle Vergütung und Wertschätzung. Es besteht ein subjektiver Bedarf an Verbesserungen der Arbeits- und Ausbildungsbedingungen im PJ. Es sind jedoch weitere Studien erforderlich, um diesen Bedarf zu quantifizieren und zu priorisieren und um die Umsetzbarkeit der vorgeschlagenen Maßnahmen zu untersuchen.

“The practical year: a qualitative study on stressors, resources, and proposed improvements among medical students”

Background

In the population of medical students and resident physicians, key stressors such as examinations and time pressure have already been identified. The psychosocial resources identified include social support from family, friends and fellow students. Medical students have already made suggestions for improvement such as more information about the university's psychosocial counselling services. The last academic year in medical faculties in Germany is the so-called practical year (PJ), which is a combination of studying and on-the-job clinical training. The PJ serves to deepen the skills, abilities and competences learnt during their studies and to immerse themselves in the work of a prospective doctor. Based on research documenting considerable stress among both medical students and resident physicians it can be assumed that PJ students likewise experience high levels of stress and draw on various resources. However, evidence remains sparse both for medical students in the practical year in Germany and elsewhere. This doctoral project seeks to identify the stressors, resources and proposed solutions of medical students in their final year.

Methods

A total of 25 PJ students at a German medical school (HHU) were recruited from a WhatsApp group called "PJ – fall 2022". Semi-structured qualitative interviews were conducted by telephone. Interviews were conducted until data saturation. The interviews were voice-recorded, transcribed verbatim and content-analyzed using MAXQDA software (2020).

Results

Eighteen female and seven male participants (n = 25; mean age: 26.6 years; standard deviation (SD = 3.7) were interviewed (mean duration = 36 minutes (SD = 7,6). Mentioned stressors included a lack of skills and knowledge, poor supervision (i.e., lack of interest in learning success, lack of fixed contact persons, lack of time for familiarization), routine tasks (i.e., lack of learning experiences due to repetitive work), lack of appreciation (mainly on the part of superiors) and a heavy workload. Resources included working with patients and their appreciation, a positive learning and working atmosphere on the wards, learning and knowledge acquisition, one-on-one supervision by a medical colleague, clinical-practical training as well as a positive work-life balance with sufficient leisure time. Among other things, the PJ students suggested a better pay and a change of absence regulations as well as the opportunity to take care of their own patients and to have structured PJ teaching.

Conclusion

PJ students perceived multiple stressors, but also resources and suggested potential improvements such as the organization and structure of the PJ, teaching and supervision as well as financial compensation and appreciation. There is a subjective need for improvements of the working and training conditions in the PJ. However, further studies are required to quantify and prioritize those needs and to explore the feasibility of the suggested interventions.

List of Abbreviations

AL	Adrian Loerbroks
ÄApprO	Licensing regulations for doctors [Approbationsordnung für Ärzte]
BAföG	Federal Education and Training Assistance Act [Bundesausbildungsförderungsgesetz]
Bvmd	Federal Representation of Medical Students in Germany [Bundesvertretung der Medizinstudierenden in Deutschland]
CDU	Christian Democratic Union of Germany [Christlich Demokratische Union Deutschlands]
COR	Conservation of Resources according to Hobfoll
COREQ	Consolidated criteria for reporting qualitative research
CSU	Christian Social Union in Bavaria [Christlich-Soziale Union in Bayern]
DIN	German Institute for Standardization [Deutsche Institut für Normung]
EN	European standards [Europäischen Normen]
EPA	Entrustable Professional Activities
FY1	Foundation Year 1 program in the United Kingdom
GAS	General Adaptation Syndrome according to Seyle
HHU	Heinrich-Heine-University
ISO	International Organization for Standardization
LG	Lisa Guthardt
LPA	State Examination Office for Medicine, Psychotherapy and Pharmacy
Mini-CEX	Mini-Clinical Evaluation Exercise
M3	Third medical state examination
NKLM	National Competency-Based Learning Objectives Catalog for Medicine [Nationale Kompetenzbasierte Lernzielkatalog Medizin]
PJ	Practical year [Praktisches Jahr]
OR	Operating room
SF	Syna Franck
SPD	Social Democratic Party of Germany [Sozialdemokratische Partei Deutschlands]
TM	Thomas Muth
UKD	University Hospital Düsseldorf
WHO	World Health Organization

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1 Introduction

1.1 The history of stress

The conceptualization of stress has its origins in foundational physiological theories developed over the past two centuries. Claude Bernard (1813–1878) first introduced the idea of the "milieu intérieur", emphasizing the importance of internal stability for the functioning of living organisms. He argued that the consistency of the internal environment is a prerequisite for an organism's independence from external conditions, laying the groundwork for later homeostasis theory [1].

Building on Bernard's ideas, Walter B. Cannon (1871–1945) advanced the concept of homeostasis, which he defined as the body's capacity to maintain stable internal conditions in the face of external demands. Cannon also introduced the term "fight or flight" response to describe the organism's immediate physiological reaction to perceived threats, involving rapid activation of the sympathetic nervous system and the adrenal medulla [2]. His work was pivotal in framing stress as a coordinated physiological defense mechanism [3].

Hans Selye (1907–1982) significantly extended these ideas by proposing the first formal biological model of stress, known as the General Adaptation Syndrome (GAS). Based on his experimental research in the 1930s and 1940s, Selye observed that organisms exhibit a consistent pattern of physiological responses to various noxious stimuli. He conceptualized this pattern in terms of three stages: the alarm reaction, the stage of resistance, and the stage of exhaustion [4, 5]. Selye brought widespread attention to the concept of stress and highlighted the body's nonspecific responses to stressors [3].

Taken together, these foundational models by Bernard, Cannon, and Selye have profoundly shaped the current understanding of stress. They have established the physiological basis for stress research and continue to influence both theoretical frameworks and empirical investigations in psychology, medicine, and related disciplines [3].

Building upon those fundamental models of stress, subsequent research has expanded our understanding of stress to encompass more complex, dynamic, and context-dependent processes. One of the most influential contributions stems from Bruce McEwen, who emphasized the role of the brain in mediating the physiological response to stress. McEwen's concept of allostasis describes the body's ability to achieve stability through change. In contrast to the concept of homeostasis, which refers to maintaining internal balance, allostasis refers to the process of achieving stability through adaptive change in response to stressors over

time. McEwen further emphasized the concept of allostatic load, referring to the cumulative wear and tear on the body's systems as a result of chronic or repeated stress exposure [6, 7].

Meanwhile, Richard Lazarus proposed a more psychological and cognitive approach to stress with his transactional model of stress and coping. According to Lazarus, stress is not solely a physiological response but rather a transaction between an individual and their environment. The experience of stress is determined by an individual's cognitive appraisal of a situation, as well as their perceived ability to cope with the demands placed on them. In his definition of stress, Lazarus distinguished between the primary assessment, in which a person evaluates a situation as challenging or potentially threatening, and the secondary assessment, in which the person recognizes that the available resources are not sufficient to cope with the stressor [8]. The definition of stress according to Lazarus can also be found in the definition according to the DIN EN ISO 10075 standard, which deals with mental workloads. In this international standard that has been adopted in Europe and also in Germany, stress is defined as an unpleasant condition that is experienced by the person as threatening, critical, important and unavoidable. It occurs in particular when a person feels that they are unable to cope with their tasks [9]. This shows that Lazarus' definition is an established definition of psychological stress.

In the years that followed, biophysiological stress research expanded the understanding of stress to the neuroendocrine system and demonstrated the role of the hypothalamic-pituitary-adrenal (HPA) axis in stress responses. Stress leads to a cascade of hormonal responses, most notably the release of corticotropin-releasing hormone (CRH) and cortisol, which help to mediate the physiological effects of stress. However, chronic activation of the HPA axis, as seen in prolonged stress exposure, can lead to dysregulation and contribute to various pathological conditions, including depression and cardiovascular diseases [10, 11].

Together, these modern models represent a broader, more integrated view of stress that incorporates not only physiological but also psychological, social, and environmental factors. These models highlight the complex, multifaceted nature of stress and underscore the importance of understanding individual differences, coping mechanisms, and the long-term impact of stress on health [12].

The associations between psychosocial work factors (e.g., high workload and long working hours) and cardiovascular diseases (e.g., coronary heart disease, (ischemic) stroke) and mental disorders (e.g., depression) were generally significant, and the magnitude of these associations was stronger for mental disorders than for cardiovascular diseases [13].

1.2 Scientific Understanding of Resources in Stress and Coping

The term coping refers to the attempt to manage the demands imposed by stressful events that are perceived as overwhelming or exceed a person's available resources. For the training of coping skills, Lazarus' transactional stress model is an extremely relevant and well-established theoretical model [14]. This stress model emphasizes two coping strategies: problem-oriented coping and emotion-oriented coping. Emotion-oriented strategies are used to deal with difficult emotions such as anger, frustration, disappointment and sadness in relation to specific stressors in the environment. Mental and behavioral strategies are used, such as creating emotional distance, using humor or seeking social support [15]. Problem-focused coping involves actively seeking a solution to the root cause of the stress through cognitive or behavioral strategies, such as gathering information, asking for help, using past experiences or skills [16].

Resources can be defined as assets or strengths that individuals can draw upon to manage stressors and maintain well-being. According to Hobfoll's Conservation of Resources (COR) Theory, stress arises when individuals perceive a threat to or loss of resources, or when they fail to gain resources after investing significant effort to obtain them [17, 18].

The role of social resources in coping with stress is well-documented. Social support has been identified as a critical factor that can mitigate the impact of stress on health. Research has shown that individuals with strong social networks experience lower levels of psychological distress in response to life stressors [19].

Personal resources, such as self-esteem, optimism, and self-efficacy, have also been shown to influence how individuals perceive and respond to stress. For instance, individuals with high self-efficacy tend to view challenges as manageable and are more likely to engage in problem-focused coping strategies. Conversely, individuals with low self-esteem or those who lack confidence in their coping abilities are more likely to perceive stressors as overwhelming and exhibit maladaptive responses [20].

Furthermore, material resources, including financial resources affect an individual's ability to manage stress. Financial strain is associated with higher levels of chronic stress and poorer health outcomes [21].

In sum, the availability and effective use of various types of resources play a significant role in how individuals cope with stress. The more resources individuals can access and utilize, the better they can buffer the negative effects of stressors and enhance their well-being. Understanding the complex interplay between resources and stress is crucial for developing effective interventions to promote resilience and mental health.

1.3 Distress among medical students before the practical year

In order to find out whether medical students and PJ students are exposed to the same or similar stressors, I would like to focus in this subchapter exclusively on the stressors of medical students before the PJ.

The distress, health, and well-being of medical students have been the focus of research for many years and continue to attract increasing scholarly attention.

Medical students have been found to be affected by numerous stressors that can significantly impact their mental and physical well-being. Among the most frequently highlighted stressors in the literature are a high academic workload, which can lead to physical and mental exhaustion; intense competition among peers; and inadequate theoretical and practical teaching. Additionally, individual characteristics such as high expectations of oneself, fear of failure, and feelings of unpreparedness for clinical tasks further contribute to student distress. Periods of social isolation, especially during exam periods, lack of leisure time, and confrontations with suffering, severe illness, and death also exacerbate stress [22-25]. Organizational shortcomings such as poor information flow and exam-related stressors - such as repeat exams, unfavorable scheduling, and perceived unfair grading - are also significant contributors to medical student distress [22]. Financial burdens can negatively affect students' mental health, academic performance, and professional development [25-27].

In addition, prior research suggests psychological distress may be higher among female students [27-29]. Other important risk factors may include the hierarchical structure of medical training institutions [30], academic standing (junior or preclinical students), fear of COVID-19 infection, a history of psychiatric or physical disorders, fear of interrupting and dropping out of studies, challenges with online learning, low levels of physical activity, problematic internet or smartphone use, and younger age [27].

It is not surprising that previous research in Europe, the United States, the United Kingdom and Asia has observed significant psychological distress among medical students throughout the course of their academic studies. Those studies suggest a high prevalence of depression and anxiety disorders among medical students, with levels of overall psychological distress being consistently higher than in the general population of similar age [25, 26, 31-34]. Evidence from a global analysis shows that over one-third of medical students experience a range of self-reported psychological and behavioral symptoms (PBS). Among these, sleep problems have the highest prevalence, followed by stress, burnout, and depression [30].

Many studies published in recent years have focused on the impact of COVID-19 on students' well-being, highlighting an increase in mental health issues as a result of the pandemic [27, 35, 36].

Potential consequences of distress and poor mental well-being among medical students include increased cynicism, reduced empathy, academic misconduct, risky substance use, and even suicidal ideation as well as exit from medical schools [25, 30, 34, 37-39].

The literature also indicates that burnout is widespread in medical school, with major US multi-institutional studies showing that burnout may persist beyond graduation and is sometimes associated with psychiatric disorders and suicidal ideation. Burnout poses a significant challenge to the well-being of medical students with concerning implications as it may continue into residency and beyond [40, 41].

Furthermore, concerns have been raised regarding the potential impact of stress on the quality of quality of delivered patient care during and even after practical medical training [42, 43].

1.4 Distress among resident physicians

In order to find out whether resident physicians and PJ students are exposed to the same or similar stressors, I would like to focus in this subchapter exclusively on the stressors of resident physicians after the PJ.

The distress of clinically active doctors after graduation has received research attention for many years. Just like medical students, resident physicians also experience various stressors such as time pressure, lack of control, and difficult workplace relationships [41, 44, 45]. A high workload [45, 46] and long working hours [44], including sleep deprivation and a lack of leisure time, as well as concerns related to mistakes and poor patient outcomes were identified as residents' stressors [47]. Work-life imbalance, inadequate surgical exposure for surgical residents as well as financial uncertainty were found to contribute to increased feelings of burnout [48]. Resident bullying, especially in the form of verbal abuse, by fellow physicians of higher hierarchical power has been associated with increased resident stress, decreased resident wellbeing as well as risks to patient safety and increased healthcare costs [49]. Individual physician-level factors such as the female sex, younger age or lower self-esteem and higher expectations of oneself are associated with higher rates of burnout [45, 50].

The transition from a final-year medical student to a newly graduated doctor has been referred to as a period full of challenges and stress [51]. Especially first-year residents feel inadequately prepared by medical school at the start of their roles. While support and feedback from senior colleagues are highly valued, they are often insufficient, with limited opportunities to discuss critical incidents or challenging situations. Common stressors include caring for severely ill patients, managing prescriptions, communicating with patients and their families, and working within inconsistent team structures. Irregular shift patterns also negatively impact their personal and social lives [52]. Further key stressors of junior doctors during their first year of clinical practice included handling their newly gained responsibility, managing uncertainty in terms of what was expected of them as well as in terms of medical uncertainty, collaborating in multi-professional teams, experiencing the sudden death of patients, and feeling a lack of support [51]. Research has shown a rise in patient mortality [53] and undesirable events among resident physicians at the beginning of the academic year. The excess risk decreased progressively after the first month, and the trend disappeared fully after the fourth month of the year [54].

Depression and burnout have been found highly prevalent among residents worldwide and across medical specialties, as resident physicians internationally face high level of stress at work [41, 45, 55-58]. 6.5% of the physicians in active practice reported recent suicidal ideation [56]. Excessive fatigue is reported about 30-50% of the respondents during residency [56, 58].

Depression and burnout among medical residents has been linked to negative consequences for work performance and patient outcomes, financial costs, and physician well-being, including career satisfaction, and quality of life [41, 45, 48, 59, 60]. Residents with higher levels of depression, fatigue and distress made significantly more major medical errors as residents who had no mental problems [56, 57, 61, 62].

1.5 Similarities and differences in the stressors of medical students and resident physicians

The fact that PJ students stand exactly between medical students before the PJ and resident physicians after completing their medical studies means that they may experience stressors from both groups of people. For this reason, I would like to compare the different stressors experienced by medical students and resident physicians in this subchapter.

Distress is a widespread issue in the medical profession, affecting individuals at both the undergraduate and postgraduate stage, and is a frequent aspect of medical students' everyday experiences [25]. Based on the current state of research, it seems that similar stressors for medical students and resident physicians are time pressure and a lack of control over time management, work planning, and work organization as well as a high workload [22, 25, 41, 44-47]. Personal factors such as low self-esteem, high self-demands, fear of failure, and feeling unprepared for clinical tasks were identified in both groups [24, 25, 45, 50, 52]. The studies indicate that female students and residents as well as people of younger age may experience higher levels of psychological distress [27-29, 45, 50]. Both medical students and resident physicians reported difficult interpersonal relationships as stressors [27, 49, 51]. The contact with suffering, severely ill, and dying patients was perceived as burdensome by the students [23, 25]. Physicians described the experience of the sudden death of patients as stressful [51].

The main stressors of medical students and junior doctors do not appear to differ fundamentally. It appears that the relevant stressors during study persist beyond the final year of study and graduation and into the time as a resident physician. However, there are some distinct factors that are more prevalent or restricted to either medical students or resident physicians. Only medical students reported intense competition among peers as stressors [23, 25]. Poor quality of both theoretical and practical teaching [22, 23, 25], as well as periods of social isolation during exam phases [24] and low levels of physical activity [27], were also mentioned only by the students. Exam-related stressors, such as repeat exams, unfavorable scheduling, and perceived unfair grading [22], and fear of interrupting and dropping out of studies, challenges with online learning, and problematic use of the internet or smartphones [27], were reported only by medical students. Surgical resident physicians mentioned that inadequate surgical practical training was a source of stress [48]. Concerns about medical errors and poor patient outcomes were reported only by resident physicians [47, 56, 57, 61, 62]. Further, some resident physicians reported bullying, particularly verbal abuse, by physicians of higher hierarchical power [49]. The research on bullying in medical education is still limited, making it difficult to find relevant information. However, medical students reported perceiving hierarchical structure of medical training institutions and academic standing (junior or preclinical students) as stressors [27, 30].

The PJ as such can be conceptualized as a transition period between medical studies and training to become a resident physician: PJ students are formally still medical students, but they already work independently or under supervision in the clinic. The PJ might represent a particularly vulnerable phase for distress and poor mental health, if PJ students were exposed to major stressors experienced by both medical students and resident physicians.

1.6 Resources among medical students and resident physicians

Previous qualitative studies have identified several key resources for medical students (including PJ students), such as supervision-focused practical training with encouraging teaching physicians, structured mentoring programs, and regular feedback sessions [22, 63], as well as effective teaching strategies that incorporate active learning methods [23] and opportunities for direct patient interaction [23, 64].

Supportive organizational factors include flexibility (e.g., optional attendance of lectures), contact persons and the possibility to repeat exams [22]. Furthermore, social support (e.g., relatives, friends, fellow students) [22, 65], individual characteristics (e.g., own attitude, prior knowledge and experience, interest in the medical field and ability to learn easily by heart), and available free leisure time (e.g. hobbies, physical activity, meeting friends) were also identified as resources that help medical students manage stress more effectively [22].

To date, there are hardly any studies on the psychosocial resources of resident physicians. However, it has been shown that training modules to develop and learn individual coping skills (e.g., emotional regulation, external support, stress management techniques, self-awareness) as well as solution-focused (e.g., conflict management and handling) and cognitive behavioral counselling reduces the stress and exhaustion levels of residents. A distinctly positive impact was also observed in relation to job satisfaction [66]. A study on first year resident physicians showed that women were more inclined to use coping strategies centered on seeking social support, reflecting their tendency to handle stressful situations through emotion-focused approaches, while male subjects were more likely to adopt humor [67].

1.7 The practical year in the medicine curriculum

The practical year (PJ) corresponds to the 6th year of the medical study in Germany. Final-year students are to complete the practical training in a clinical setting for 48 weeks [68].

The practical year is split up in three 16-weeks training periods (i.e., “tertials”) which must be completed in different fields of medicine: one tertial must be completed in the surgical ward, including general, visceral and pediatric surgery, cardiovascular surgery as well as trauma and hand surgery. Another tertial must be completed in internal medicine. This includes endocrinology and diabetology, hematology, oncology and clinical immunology, intensive care medicine, cardiology, pneumology and angiology as well as rheumatology. The last tertial is the so-called elective tertial and it can be completed in any medical department. At the University Hospital Düsseldorf (UKD), Germany, electives include general medicine, anesthesiology, ophthalmology, dermatology, gynecology and obstetrics, ear, nose and throat medicine, pediatrics, medical microbiology, virology and infection epidemiology, oral and maxillofacial surgery, neurology, neurosurgery, nuclear medicine, orthopedics, palliative medicine, pathology, (clinical) pharmacology, psychiatry, psychosomatic medicine, radiology, (clinical) forensic medicine, radiotherapy and urology [68].

Students can determine the order of the three tertials themselves [68].

All tertials can be completed in one or different hospitals in Germany (including the UKD or academic teaching hospitals) or abroad (external institutions). It is possible to split tertials, which means that all tertials can generally be divided into two segments of eight weeks each. While PJ students individually have to organize tertials abroad, PJ training positions at university hospitals and teaching hospitals in Germany are mostly managed via an online portal [68].

Each year there is a spring cohort and a fall cohort and thus students start their practical year in mid-May or mid-November. Each PJ cohort comprises approximately 100 students [68].

Learning objectives of the PJ at the Faculty of Medicine at Heinrich Heine University (HHU) Düsseldorf

In accordance with the statutory provisions (§§ 1, 3, 4 ÄApprO), the study and examination regulations of the Faculty of Medicine at HHU set out the objectives for training in the practical year. According to these regulations, students should learn to apply the theoretical knowledge they have acquired to patients, develop the skills and abilities they have already acquired, gradually take on medical responsibility and grow into medical activities. Students should receive practical training by helping to care for patients under the guidance of a medical supervisor, attending practice-related teaching events (e.g., case discussions, seminars,

special subject-related events) about 2.5 hours per week and taking part in clinical-practical discussions such as pathological-anatomical demonstrations or x-ray discussions (at least once a week). According to the study and examination regulations, every student is obliged to take part in hospital teaching events. The person responsible for the implementation of training is the PJ representative of the HHU. The provisions of the curriculum for the PJ also apply to academic teaching hospitals. The Faculty of Medicine and the operators of the academic teaching hospitals instruct the PJ coordinators to comply with the training guidelines for medical students at Heinrich Heine University Düsseldorf during their practical year. [69].

To support the achievement of these learning and competency objectives, the HHU has established a set of guidelines. These include the integration of students as future physicians, into clinical routines, the independent admission and examination of patients, and the development of further diagnostic and therapeutic plans in collaboration with their supervising physicians. Each student should be assigned a teaching physician who serves as a tutor and is available on a daily basis for a period of time appropriate to the educational goals. Students should be given the opportunity to follow and care for inpatients from admission to discharge and to present these cases during ward rounds. Working hours at the hospital should be 25 to 30 hours per week. Students are supposed to receive structured feedback from their tutor at regular intervals, at least every two weeks. On specific days, students should have the opportunity to practice and refine hands-on clinical skills under the guidance of experienced physicians, particularly in diagnostic and therapeutic procedures such as ultrasound, endoscopy, or functional diagnostics. Students also should have regular opportunities for individual discussions with the assigned final-year (PJ) coordinator. It is explicitly stated that frequent assignments in nursing services, patient transport, or administrative roles (e.g., ward secretary tasks) do not fall within the scope of responsibilities for final-year medical students. During each rotation, students are expected to participate in two night shifts and one weekend shift. Adequate time for self-directed learning should be ensured, eliminating the need for separate study days.

1.8 International comparison of medical curricula with a focus on the final year of study

Similar extended clinical periods at the conclusion of medical studies are also incorporated into medical curricula elsewhere, as in many countries around the world the final year of undergraduate medical education is heavily focused on clinical practice, though the specific structures and content vary significantly.

In Sweden, for instance, final-year medical students in their tenth and eleventh semesters primarily engage in clinical courses, making this phase a core component of practical training [70]. Similarly, in Finland, students who have completed their first four years of medical education are temporarily authorized to perform supervised physician tasks in specialized medical care units or primary health centers, though not in all clinical roles [71].

In the Netherlands, the “VUmc Compass” curriculum consists of a three-year bachelor’s and a three-year master’s program. The first two years of the master’s phase include mandatory clerkships with gradually increasing levels of responsibility. The final master’s year is composed of a research internship, an elective clinical placement, and a "semi-doctor" clerkship in a specialty of the student’s choosing. This curriculum is built around a competency-based learning model that uses the CanMEDS framework as a foundation [72].

In Belgium, final-year medical students are largely engaged in internships [73]. In Ireland, the final year follows a modular curriculum covering psychiatry, obstetrics and gynecology, general practice, and pediatrics, with integrated assessments at the end of each module [74]. Following graduation, students enter a one-year paid internship equivalent to the Foundation Year 1 (FY1) program in the United Kingdom [75].

In the UK, final-year students participate in "student assistantships," defined as supervised placements where students take on many of the duties of FY1 doctors. This model is designed to ease the transition into clinical practice [76].

In the United States, a scoping review found a growing trend toward standardized assessment frameworks aimed at preparing students in their final year for postgraduate training. Many of these programs are institution-specific and include preparatory courses for residency, highlighting the potential for broader collaboration in curriculum design [77].

In Australia, final-year (sixth-year) students complete extensive clinical rotations [78, 79].

In China, the main model of clinical medical education follows a “5+3” structure, comprising five years of undergraduate education and three years of postgraduate training. The final year includes clinical rotations across various disciplines with a strong emphasis on hands-on practice [80].

In Saudi Arabia, students complete a six-year medical program followed by a mandatory one-year internship. During the final year, students rotate through internal medicine, surgery, and pediatrics with an emphasis on practical training. Each rotation ends with a written and practical exam [81].

In conclusion, while the structure, duration, and evaluation methods of final-year medical education differ by country, there is a shared focus on comprehensive clinical preparation. This period serves as a critical bridge between academic study and professional medical practice, aiming to equip future physicians with the practical skills and competencies needed for patient care.

1.9 Current Research on Final-Year Medical Students (PJ Students)

A substantial proportion of final-year medical students in Germany exhibited significant psychological strain, with 42.4% showing clinically relevant stress levels. Furthermore, 35.0% met the criteria for burnout necessitating clinical intervention despite generally high levels of empathy and motivation, while 12.4% reported experiencing symptoms of anxiety and 13.6% reported experiencing symptoms of depression [82]. These results underscore the significant mental health challenges faced by medical students throughout their PJ. Despite everything, generally high levels of empathy and motivation were demonstrated among PJ students [83] [84]. Students who are due to complete their studies in the current or next semester indicated a low level of satisfaction and a high need for action with regard to the final year of medical studies [85].

Surveys [86, 87] and studies with PJ students in Germany [63, 88-90] [82] and elsewhere [74] have identified several stressors such as a lack of guidance and feedback from supervisors, work overload with routine activities or nonmedical tasks, lack of integration into the ward team, poor communication between students and physicians, worries about the future and financial worries. Supervising physicians were perceived to lack time, and the numerous routine tasks led to inadequate training in managing patients independently, which in turn caused feelings of uncertainty and a fear of making medical errors. [89]. Challenges faced by final year medical students during their first experience of working were a “reality gap” (discrepancy between the students' previous understanding of the professional requirements and their experiences, e.g., necessary clinical knowledge and skills), making use of existing knowledge (e.g., integration in practice) and negative feelings and emotions (e.g., stress, anxiety, fear) [91]. Cognitive effects included overthinking, difficulty concentrating, feelings of failure, hopelessness [74]. PJ students reported disruptions in sleep and appetite, as well as fatigue and exhaustion [74]. Some challenges faced by students during their final year differ significantly from those encountered by medical students before the final year. They work in interprofessional and interdisciplinary teams in clinical settings, which involves a high performance pressure. They frequently carry out various medical tasks and must meet the expectations of the supervising physicians. Additionally, some students have to take on side jobs alongside their clinical duties to support themselves financially [88].

The psychosocial resources included, amongst others, support from family, friends and physicians as well as physical exercise, engaging in non-academic activities, and practicing meditation [74, 82, 88, 90]. Avoiding discussions on medical matters, building new relationships and smoking were reported as stress-coping strategies [81].

In Magdeburg, Germany, opportunities for improvement were investigated, particularly with regard to further training and the optional preparatory courses called “Ready for PJ”, which were seen by the students as very good preparation for the PJ. Interprofessional collaboration,

taught by instructors focusing on interprofessional teamwork, was scored positively and highly valued. The concept allows students a better appreciation of their role in patient care and the tasks that they will face [92].

PJ students from Heidelberg, Germany, indicated that, for example, a computer-based system that consolidates medical information about patients would improve communication and help prevent information loss. The students also indicated that they would find the establishment of doctor-led teaching sessions on the ward, participation in ward rounds, and increased supervision by senior physicians useful. To reduce stress, the introduction of refresher or repeat courses was suggested. Additionally, students proposed interprofessional and patient-centered communication training to improve communication between medical staff [88].

A training program for final-year medical students in Leipzig, Germany, which included mentoring, feedback, and workplace-based assessments, was highly positively received. The program was deemed helpful and meaningful, with students reporting increased confidence and preparedness for their Third medical state examination (M3) and career start. The demand-driven, mentoring-based curriculum not only boosted student satisfaction but also improved teaching quality in a resource-efficient manner. Mentoring played a key role in promoting learning success through personalized feedback and support, while enhancing both communicative and social skills for students and mentors alike. [63]. A neurosurgical one-on-one mentoring program at University Hospital Tübingen, Germany, was well received by participating students and acquisition or improvement of clinical practical skills was achieved by most students. A varying practical skill level was seen. The program allows for individually tailored learning of clinical practical skills [93]. The Medical Faculty of the University of Jena in Germany designed a project called "PJplus", which includes mentoring and feedback in form of workplace-based assessment by means of Mini-Clinical Evaluation Exercise (Mini-CEX) in combination with training workshops for supervisors. PJ students in the PJplus group were significantly more satisfied with their PJ and felt significantly better prepared for practical work after finishing studies than the control group [94]. To better support students´ self-regulated learning strategy, it is necessary to ensure availability of experienced physicians as supervisors [90]. Effective educational strategies and the motivation of medical supervisors play a crucial role in shaping the workplace learning environment [89].

A well-organized curriculum that incorporates cognitive, procedural, and communicative learning objectives, along with the implementation of designated time slots for bedside teaching, is viewed as an essential initial step in this process [89].

Final-year medical students could benefit from enhanced or more targeted training in areas such as management skills, professionalism, and evidence-based medicine. Self-assessment surveys may serve as valuable tools to track the progression of competencies throughout

undergraduate education [95]. The recommendations focus on improving the learner's expertise by using 'whole task' training methods and integrated learning, while also addressing negative emotions and fostering continuous 'learning on the job' [91].

Pharmacist-led prescribing programs for final-year medical students at universities in Australia, have shown a potential effect on the skills and confidence in prescribing by the students. It provided an interprofessional teaching opportunity, preparing students for a team-based approach to patient management [78, 79].

Both students and physicians have a significant need for information regarding the framework and didactic implementation of clinical and practical training during the final year. Until now, some German faculties have provided sporadic and somewhat unstandardized information and support. A website (“PJ-input”) has been launched that consolidates information about the final year to support both students and supervising physicians in the teaching-learning process and improve the quality of competency-based education during the final year [96]. For instance, the concept of "Entrustable Professional Activities" (EPA) was incorporated, providing guidance to students and supervising physicians for the gradual assumption or transfer of responsibility [96, 97]. Medical schools must ensure that students gain early access to clinical settings that offer ongoing, "meaningful" interactions with patients and provide increasing opportunities to take on responsibilities similar to those of a junior doctor, even while still students, in order to support their transition to professional life as resident physicians in the best possible way. [51]. Final-year medical students show significant gaps in performing practical clinical skills during formative assessments. Regular and institutionalized assessments of practical clinical skills throughout medical education, particularly in the final year, could prove beneficial [98].

1.10 The research gap and objectives of the study

Although final-year medical students are occasionally chosen as study participants, the vast majority of existing studies focus on the implementation of new teaching methods or other instructional improvements during the final year. There is a noticeable lack of research investigating the specific stressors, available resources and desired improvements experienced by students in the PJ. In this case, qualitative studies are particularly suitable, as they provide deeper insights into problems and a better understanding of a subject area than quantitative research. In addition, individually desired measures can be expressed as suggestions for solutions.

The only qualitative study published to date that examined stressors, resources, and suggestions for improvement among PJ students relies on eight interviews. [88]. The small sample size suggests that data saturation was likely not achieved. Data saturation is a quality criterion of qualitative research [99].

Furthermore, the participants in the prior study were enrolled at Ruprecht-Karls-Universität Heidelberg, which also offers a model medical curriculum. However, this curriculum differs from the one implemented at the HHU Düsseldorf. Therefore, location-specific stressors may exist, and the findings from one medical school cannot necessarily be generalized to others.

Additionally, the aforementioned study was conducted in 2016. Since then, stressors, available resources, and students' suggestions for improvements during their final year may have changed significantly, especially due to the COVID-19 pandemic. The global COVID-19 pandemic led to extraordinary public health interventions, significantly affecting the healthcare sector [100-103] and the education system worldwide. As a result, numerous universities suspended in-person teaching and on-campus examinations. The impact on medical education has been substantial, particularly affecting the transition from medical student to resident physician. Disruptions to student assistantships had the greatest influence on students' confidence and preparedness [27, 104, 105]. The perspectives of the cohort of medical students who completed their final year (PJ) during the COVID-19 pandemic—and the implications for their future professional practice—remain an under-researched area [75]. Therefore, we do not know if studies in the pre-COVID-19 era capture the distress experience, resources and suggested improvements of PJ students as in the post-COVID-19 era.

Moreover, the inflation and current energy crisis—leading to sharply increased housing and food costs—may contribute to greater financial concerns and the need to take on part-time jobs. This is particularly relevant given that the financial compensation for PJ students remains unchanged at €373/month (at UKD).

We therefore sought to expand and complement previous research findings by exploring

1) the specific stressors,
2) the psychosocial resources experienced by PJ students and
3) which improvements they suggest to improve working conditions in clinical practice going forward.

Our study findings could provide hospitals with valuable insights on how to enhance clinical training during the PJ and increase the satisfaction of their PJ students. Medical students primarily select their PJ location based on practical considerations such as financial incentives and proximity to their living environment, but public reputation and personal recommendations also play a significant role [106]. By understanding what students value most during this formative year, hospitals can position themselves as attractive employers early on. However, despite the critical influence of the PJ on students' future career choices, many are still predominantly assigned non-medical tasks, indicating a disconnect between the educational potential of the PJ and its current implementation [63]. Optimizing PJ experiences is therefore essential—not only to better support students' professional development but also to strengthen recruitment and retention strategies beginning already during the final year.

2 Material and methods

We adhered to the consolidated criteria for reporting qualitative research (COREQ) [107].

2.1 Research team

The research team consisted of a doctoral student who is herself a medical student (Syna Franck (SF)), a research assistant experienced in qualitative research (Lisa Guthardt (LG); [108, 109]) and two senior researchers (Thomas Muth (TM) and Adrian Loerbroks (AL)) who are experienced with regard to stress research among medical students using qualitative methods [22, 24, 110]. SF conducted the interviews under the supervision of AL and TM.

2.2 Study participants and recruitment

Study participants were medical students at the Heinrich Heine University Düsseldorf, Germany, who were at the beginning of the second tertial of their PJ (11th semester) at the time of data collection. We chose this point of time, because we assumed that participants already had some experience (compared to the first tertial), but had not become completely accustomed to the PJ yet (compared to the third tertial). The students were located in Germany or abroad at the time of data collection and were recruited from the 2022 fall cohort. Participants were recruited from a WhatsApp group called "PJ – fall 2022" with 184 members. Initially, more female students expressed an interest to participate, which is why later recruitment stages specifically targeted male students. Participants received a financial compensation of 30 euros. PJ students provided informed written consent prior to their participation.

2.3 Study design

We used a qualitative interview approach. Rather than collecting numerical data points, intervening or introducing treatments as in quantitative research, qualitative research helps to further explore and understand phenomena. Qualitative research explores the experiences and perceptions of participants. Due to the open-ended nature of the research questions, the design of qualitative research is often not as linear as quantitative design. One of the strengths of qualitative research is its ability to explain processes and patterns of human behavior that are difficult to quantify [111]. This study design is particularly useful for researching little-known topics. Qualitative studies in the form of focus groups or individual interviews offer the opportunity to obtain broad and in-depth information from students [22].

2.4 Data collection

SF conducted semi-structured telephone interviews based on a topic guide between mid-March and early April 2023. In order to develop the topic guide, we relied on topic guides from previous studies by the research group on stressors, resources and potential support needs of healthcare workers (medical assistants) and medical students, while taking into account the current research literature. The topic guide was discussed several times within the study team until consensus was reached, was reviewed and further adapted during data collection (see Appendix). After four interviews, AL listened to the audio files of the recorded interviews and gave feedback to SF regarding her conduct of the interviews. We also collected background data from the participants based on a standardized questionnaire that addressed age, gender, semester, hours worked/week, the specialty and location of their current tertial as well as mental health data measured by the "Patient Health Questionnaire-2" (PHQ-2) [112-114] and the "Generalized Anxiety Disorder-2" (GAD-2) [114, 115] (see Appendix). The interviews were continued until it was felt that data saturation was reached, which seemed to have been the case after 18 interviews. Seven more interviews were conducted to verify this assessment. The interviews were transcribed. Transcripts were not sent back to the participants for comments and/or corrections.

2.5 Data analysis

The background data (e.g., on age, gender, etc.) were entered and analyzed in terms of descriptive statistics (i.e. frequencies and means with standard deviations [SD]) by SF using Microsoft® Excel® (version 2503).

The interviews were content-analyzed [116] using MAXQDA (version 2020, VERBI GmbH, Berlin, Germany). Two members of the research team (LG and SF) independently coded the first 12 interviews. The resulting code systems were discussed until consensus was reached. That coding system was used by SF to code the remaining interviews and was expanded during that process. The coding system and coded segments were repeatedly checked by LG and AL during the analysis. AL reviewed the entire coding system again after all interviews had been coded. It was then minimally revised, and all interviews were coded again by SF. This coding round was considered final. A combined deductive-inductive approach was chosen for the coding: the three main categories (stressors and resources as well as suggested solutions from the perspective of the PJ students) were formed based on the research question and the topic guideline. Some subcategories were also created deductively based on study results from the research literature [88]. Further main categories and subcategories then emerged from the material in the process of analyzing (inductive approach).

2.6 Ethical approval

Ethical approval was obtained from the Ethics Committee at the Medical Faculty of the Heinrich Heine University Düsseldorf on 27.12.2022 prior to data collection.

File number assigned by the Ethics Committee of Heinrich Heine University in the context of ethical and legal advice: 2019-510_5

Applicant: Prof. Dr. med. Peter Angerer / Dr. Thomas Muth

2.7 Use of Artificial Intelligence

I partly used DeepL SE and AI in the form of ChatGPT-4o for linguistic optimization. I did not use AI for the content analyses.

3 Results

Findings are presented arranged by following four main categories: sample description, stressors, resources and suggested improvements. Supporting quotes were translated from German to Englisch by LG, who has a master's degree in literary translation.

3.1 Sample description

Eighteen study participants were female and seven were male (n = 25; 23-38 years; Ø 26.6 years; SD = 3.7). The interviews lasted an average of 36 minutes (SD = 7.6; min = 26; max = 49). On average, the students worked 37.1 hours/week (SD = 4.8; min = 25; max = 46). The prevalences of depressive symptoms and anxiety were substantial. As much as 44% of participants began their elective traineeship, while 28% of participants were in surgery and 28% were in internal medicine at the time of data collection. More than half of the respondents were in an academic teaching hospital (52%), around a third (36%) in a university hospital and just under 12% reported to be located abroad.

The composition of the sample is described in the following table.

Table 1: Sample description (n = 25)

Characteristics	
Age (years); mean (SD[a])	26.6 (SD = 3.7)
Gender, n	
Female	18
Male	7
Interview duration (minutes), mean (SD)	36 (SD = 7.6)
Working hours (incl. overtime; hours/week), mean (SD)	37.1 (SD = 4.8)
Number of working hours of study participants per week	
< 25	0
25-30	4
31-35	8
36-40	9
>40	4
Depressive symptoms[b], n	
Yes	22
No	3
Anxiety[c], n	
Yes	16
No	9
Current rotation, n	
Elective tertial[d]	11
Surgery	7
Internal medicine	7
Current location of the rotation, n	
Academic teaching hospital	13
University hospital	9
Abroad[e]	3

[a] Standard deviation; [b] Patient Health Questionnaire-2 (PHQ-2): The PHQ-2 focuses on the two main criteria of major depression according to DSM-IV: loss of interest and depressed mood; [c] Generalized Anxiety Disorder-2 (GAD-2): The GAD-2 is a screening parameter for recording anxiety disorders; [d] Anaesthesiology (n = 4), radiology (n = 2), radiotherapy (n = 1), urology (n = 1), neurology (n = 1), otolaryngology (n = 1), dermatology (n = 1); [e] Switzerland (n = 1), South Africa (n = 2)

3.2 Stressors

3.2.1 Negative learning and working atmosphere

PJ students often perceived a negative learning and working environment which is characterized by social tension in the ward team, stressed and overworked doctors and no room for questions and mistakes of the students.

In addition, students felt a lack of appreciation and recognition for their performed work by doctors and nursing staff and/or patients.

"You're feeling like some kind of lackey who is doing someone's dirty work. And you don't really feel appreciated that way."

"Well, there were some wards or departments where they didn't include you at all. You were just the resident idiot doing all the tedious work. And you also had to run some errands that were really unnecessary."

Furthermore, PJ students mentioned rough treatment by doctors and nursing staff.

"Nursing staff who would scream at you for no apparent reason, just because you were too slow. Or they asked you why you were so stupid and missed that vene in blood sampling."

"[…] Senior physicians or the chief physician who didn't ask what my name was during the whole tertial, even though I was assisting them in surgery almost every day. And for me, this was most stressful, that I was completely ignored and overlooked."

Also, the low compensation is felt to express a lack of appreciation. Students saw themselves as lone fighters (i.e., no mutual help in the team between PJ students, nurses and doctors), which was perceived as stressful.

3.2.2 Poor teaching

Throughout the entire PJ period, teaching events and time for self-study is supposed to be scheduled [68]. A lack of structure, an arbitrary choice of topics and inadequate scheduling of PJ teaching units were perceived as stressful, as was the frequently used format of frontal teaching.

"There were PJ seminars every Friday where the doctors would randomly talk about certain topics, provided that they showed up at all. The seminars aren't really structured. For example, one surgeon tells you: 'Alright, let's talk about colon carcinoma.' And the next day, there is another surgeon telling you: 'Well, I have prepared colon carcinoma for today […] Oh

well, what else do you want to do?' Most seminars were like that, and I think that wasn't very useful."

Teaching doctors were felt to have shown little to no initiative regarding teaching content, and to have not supported the students or treated them with complete indifference.

PJ students reported a lack of fixed contact persons or inexperienced, overworked or overstrained contact persons (usually resident physicians).

"What really bugs me at the surgical ward is the fact that you don't really have any contact person at all. […] Nobody feels responsible for you. This means you're just standing around somewhere, feeling lost and you hope that someone takes pity on you, takes you with them and guides you through the daily work routine."

3.2.3 Work content

PJ students found it frustrating to only be allowed to watch medical activities or to run after their medical colleagues. Taking on non-medical activities (e.g. errands within the hospital or picking up doctors at the railway station) or daily routine tasks (e.g. taking blood for hours on end) do not lead to any relevant learning gain in their view.

"That you're often just given some, let's say, unpleasant tasks that just have to be done. […], I have nothing against doing things that have to be done, just like that. But the fact that you're somehow given a lot of things to do throughout the day without any educational factor. And de facto, the plan is actually that we somehow learn more, that we actually do medical tasks and get to know them and are taught them. But I think that happens relatively little."

3.2.4 Death/dying

Students mentioned emotional stress during the PJ related to experiences of death and dying. This held especially true when this was encountered for the first time and/or when they felt unprepared (e.g., when they had no seminars on how to cope with death and dying yet).

"And then I had to reanimate the patient […]. And this adrenaline […] and the feeling afterwards because she died. […] That was the first time a patient died in my hands. And […] I was mentally overwhelmed in that moment."

"That was the cardiac surgery intensive care unit. With many people who died. 27-year-olds who were dying. I find that very stressful. And I had the feeling that somehow there was nothing there. So I didn't know where to go at all. I spoke to a doctor once, but I got relatively little understanding. I think he just didn't know what I was getting at."

3.2.5 Workload

A high workload was experienced as stressful, but the same held true for a workload that is too low. PJ students seemed to have wanted challenging tasks and responsibility and felt underchallenged by routine tasks or non-medical tasks. However, if they are given new or many tasks or (too) much responsibility, they quickly seemed to feel incompetent and overwhelmed.

"I experienced phases of pure overload within the first two weeks, when the senior physician asked you to do some things you've never done before, and you would just do them. Sometimes, these are just small things, like dictating doctor's letters, and you have no clue at all, but you just do it. Or when the doctor tells you to turn the alarm off here and there or asks you if the venous catheter is still not placed? And you just don't know how to properly do these things yet."

"It happens quite often that you are basically alone on the ward because all doctors are in the OR or busy with other examinations or whatever. And then you're the person responsible in case of an emergency. And this responsibility really scares you. I personally do not feel ready to properly deal with that."

"Last week, it was half past four already and a patient hadn't woken up from anesthesia yet, it just took a lot of time. And then, the assistant doctor I was working with said: "Alright, I'll leave the PJ student with you, I'm going home now."

The days on which students spend up to eight hours in the operating rooms are described as particularly stressful (constantly standing, holding hooks, no natural light, etc.). Some students have underestimated the extent of the workload and perceived the PJ as far more demanding than their previous medical studies.

3.2.6 Ward rotation

Within a tertial (e.g., internal medicine) students usually rotate to different wards or departments (e.g., cardiology, nephrology, intensive care medicine). There was no consensus on the desirable time intervals for these ward rotations. Some students spoke of too frequent rotations and some of too few. Overall, however, 4-week rotations were usually considered too short to develop a routine. Some students mentioned the initial stage on a new ward as a challenge because they are always the new person and because their working environment, their colleagues and superiors often change. Students expressed their perceived need to prove themselves again and again (especially after each rotation) in order to be allowed to work independently. Some PJ students talked about the lack of fixed rotation plans. They were

assigned to new wards every morning and did not know in advance where and with whom they would be working that day.

"I thought that was a bit of a shame, because I think four weeks is too short for the PJ. Because, at the beginning, you need one or two weeks to settle in and really be able to work productively. Intensive care medicine, for example, was too short. To get an insight, that's fine. But to have the feeling that you're really learning something and taking something away with you, it's actually too short."

"We have rotations that last two to three weeks. That means you're always on a new ward very quickly and have to get back into the routine. And I personally find that very stressful, because I feel like, okay, I've just adjusted to one ward, then I'm off again. Then I start all over again, have no idea what the people are called, how the ward is structured, what the procedures are like and these are all uncertainty factors that totally stress me out."

3.2.7 Social interaction

PJ students sometimes perceived the treatment of patients by nursing and medical colleagues as very rough.

“During ward rounds, there were four senior physicians and three assistants rushing in there and they pulled the plasters off the patients’ wounds somehow, they didn’t even really look at them. They just quickly put on a new plaster and the patient didn’t even have a chance to tell them how he was feeling. And then, the doctors rushed out again and I often stayed in the room because I noticed that the patient still had some questions.”

Some students were also disappointed because the role of PJ students seemed to be rather unknown in the general population and patients seemed to have little trust in the students' abilities compared to the ward doctors. The lack of recognition of performance as a PJ student seemed to be particularly evident in the interaction between female students and patients.

“I had a student apprentice with me on the ward and he talked with the doctor a lot. And I was the person who was being interrupted, or patients showed me pictures of their animals or children, even though I was doing an anamnesis interview. […] There are three people wearing gowns, two of them are male, one is female. And the female is the one they address with trivial issues and all the questions and important things are left to the men. And that really annoys me.”

Inter- and intraprofessional interaction (e.g., between nurses and doctors as well as between doctors from different departments and hierarchical levels) was sometimes experienced as tense and uncooperative. Students reported that communication between and within the

professional groups was difficult, e.g., due to a harsh tone and the emphasis on hierarchical structures.

“It’s a very hierarchical structure. So, the chief physician makes it very clear that he is the chief physician, and the senior physicians make it very clear that they are senior physicians. Things are carried out via the assistants, even though they are not responsible. But you can really tell that the stress is passed on from the top down in a way. And those who are least responsible for it actually take the brunt of it.”

Furthermore, according to the participants, nurses and doctors were often unaware of the tasks that could be carried out by PJ students and therefore had too high expectations.

If too many PJ students were assigned to a department, it also seemed that the students competed for the available tasks. However, it was also perceived as negative when PJ students had to work alone, as the work could not be divided up and arrangements with other students could not be made.

The lack of integration into the team was perceived as a stressor. Such lack of integration was described in terms of students feeling not accepted as a part of the team, a lack of interest in the students or a lack of involvement in the distribution of tasks in the department.

Students talked about the fact that they received little or no feedback on how they work. They also found it frustrating when they could not seem to please their superiors despite their best efforts.

3.2.8 Time

The so-called absence regulation – in accordance with the State Examination Office for Medicine, Psychotherapy and Pharmacy (LPA) – was described as a further stressor. This regulation states that 30 days of absence are permitted during the entire PJ regardless of the reason for the absence (including both vacation days and sick days). A maximum of 20 days of absence within a tertial is accepted. Additionally, there is no fixed learning period between the end of the PJ and the third section of the third medical state examination (M3), which means that a lot of course contents must be prepared in a short period of time. As a consequence, most students plan to take 20 days off work at the end of the third tertial. Accordingly, students generally save 10 days for potential absenteeism and vacation during the PJ. This absence regulation seemed to result in students feeling that they are not allowed to be ill or take vacation. Furthermore, from the students' point of view, this regulation led to presenteeism, as absence days are saved for more severe illnesses that may occur later in the PJ.

“However, I think it’s a bit stupid that sick days are also included. Especially this semester, because the rule of isolation due to covid has been dropped, so it no longer counts as an excuse but is also included in the days of absence. In general, I think it’s annoying that every employee is naturally allowed to be sick, and we are not, or it is imposed on us later on, when we want to prepare for the third state examination.”

"If we had coronavirus during the intensive care unit rotation, for example, where some of the patients are really sick. We would still have to come to work wearing a mask. Because we might not be able to afford to use up our sick days. Because they are either already gone. Or because we would like to use them for learning. In any case, I don't think that's good. Especially because you might get infected in hospital. I think that's definitely something that can be improved on and is very uncompassionate."

PJ students also criticized the lack of study time they have in a week. Students worked an average of 37.1 hours per week (SD= 4.8). This is well above the 25-30 working hours per week prescribed by the HHU study and examination regulations. Students had the feeling that there is hardly any time to catch up on topics or adequately prepare ward rounds for the following day at home. In addition, some hospitals did not offer study days, e.g., days on which students can use their free time to study (usually at home and one study day per week or every two weeks).

"I couldn't take lunch breaks very often. And when I did, I always had to ask for it myself. So I really had to say, guys, I'm going to take a half-hour break and eat something. Exactly, so no consideration was given to that at all. It was never a problem if I said I was going to take a break. But exactly, they didn't somehow say yes, you have a break from then until then."

3.2.9 Finances

PJ students reported on the low expense allowance, which is perceived as unfair compared to other professional groups in training phases (including nursing trainees) and resident physicians. In addition, there were considerable differences between hospitals and (federal) states according to the PJ students.

“I think the payment is extremely awful. Sometimes, you really have gratification crises. You’re thinking about the fact that you spend nine or ten hours a day here, you also stay longer to help others. And at the end of the month, you don’t really see that. Instead, you have to try to get enough money. That was really stressful for me. Because you also compare your situation with people who have other jobs, and they don’t have to work that much and get more money for it.”

"I've done the math. So for the first tertial, well, that was my elective tertial, I really enjoyed doing it. But I was there for 40 or 45 hours a week, and when you add up the 543 euros you get as an expense allowance, it was somehow 2.60 euros or less an hour."

3.2.10 Future employment

Students who had been able to complete one or more tertials in the clinic of their choice seemed to be particularly motivated to make a good impression in order to be considered for future employment. To achieve this, they accepted extra work, aimed to stay concentrated and consistently interested, which was described as exhausting in the long term.

PJ students feel poorly prepared for the start of their career as a junior doctor. They also reported fear of the future, e.g. of working as a newly qualified physician (e.g., due to responsibility, overtime, shift work, ...), but also due to the upcoming choice of specialist and possible health problems later on (e.g., back problems due to standing or holding surgical heels for many hours in the OR).

3.2.10.1 Staff shortage

PJ students who work on understaffed wards or departments seemed to be particularly stressed. In some cases, practical year students felt that they are employed as full-time medical staff. They reported having to carry out routine tasks on several wards, sometimes requiring several hours of work and leaving no time for sufficient patient contact, teaching or interesting activities with the provided learning opportunities. The doctors and nurses sometimes seemed to be stressed and had less time for teaching and/or training and supervision.

“Currently, we don’t have many medical employees at our hospital. So, there are three internal departments. Consequently, I also help out in other departments, I take blood samples and so on, and this often takes the whole morning. At the moment, like I said, everyone is extremely stressed and occupied due to the lack of staff. Accordingly, there is little time for teaching.”

A summary of the mentioned stressors of the PJ students can be found in the following table.

Table 2: Stressors of the PJ students

	Stressors
Learning/working atmosphere	• Lack of appreciation/ recognition • No collegiality/ lone wolf mentality • Quarrels/ blasphemies • Bad manners/ harsh tone • No room for error • No room for questions/ uncertainties
Teaching	• PJ Teaching/ Courses: Structure, format, commitment, timing/ scheduling, topics, absences • Catalog of learning objectives • Supervision: medical contact person/ supervisor, no demands and support, lack of training
Work	• Emotional stress: death/ passing away, no contact person/ preparation • Work content: non-medical activities, no increase in learning/competence, administration/organization, routine tasks • Work processes: interruptions, inefficient/ time-consuming processes • Lack of skills and knowledge: practical uncertainties, technical/ theoretical uncertainties, fear of making mistakes, recalling knowledge/ putting theory into practice • No/ little independent work: changing supervisors, running behind/ sitting around, no patients of their own, poor preparation for career start • Workload: high workload, low workload • Scope for action: fear of disadvantage in M3, too much responsibility, too little responsibility
Organization	• Bureaucracy • No clear guidelines: no employment contract with a clear number of working hours/ week • Lack of work clothes • Ward capacities (sometimes up to 7 PJ students per department) • Rotations: new staff/ supervisors, new environment
Interpersonal relationships	• Groups of people: Nursing staff, doctors, patients/relatives, PJ students, interprofessional interaction, intraprofessional interaction • Contents: team integration, hierarchy, communication, expectations too high
Time	• Night shifts/ shift work • Lack of break times • Working hours: Working on weekends/ public holidays, early start of shift, no daylight, overtime/ late end of shift • Working under time pressure • Absence regulations • No study days
Finances	• Expense allowance • Part-time job • Living expenses and rent
Personal matters	• PJ clinic as potential first employer

	• Fears/worries about the future regarding the upcoming choice of specialist and work as a junior doctor (responsibility, overtime, shift work) • Commuting • Doctorate • Physical and mental stressors • Character traits • Negative work-life balance
Technologies	• Working with machines/programs • No own workplace
Other	• Staff shortage

3.3 Psychosocial resources

3.3.1 Positive learning and working environment

Some PJ students perceived the learning and working atmosphere as particularly positive when supervising assistant doctors and nursing staff showed interest in the students' learning success, were committed, integrated them into the team, when the students' work was appreciated by superiors and patients and when they had as much contact with patients as possible. The students appreciated being given enough time to ask questions.

"I'm always more motivated and happier when I'm able to work with patients a lot. For me, this is just so much fun, because they are usually very grateful."

3.3.2 Teaching

One-on-one teaching is a variant of teaching where each PJ student is assigned to a permanent mentor, that is, a doctor who the students can accompany every day. This approach was mentioned as particularly positive by the students, since this mentor served as a permanent contact person for them. Students found the professional exchange instructive, as they were encouraged to think along and make suggestions regarding differential diagnoses, diagnostics and treatment options. They benefited from regular, short oral and written job-related intermediate examinations led by their mentor. The opportunity to also focus on what interested them and to help shape some of the teaching content was also perceived as a resource by PJ students. This included adapting the rotation schedule within a tertial according to their own priorities and having flexible working hours (i.e., the choice between working in the outpatient clinic, on the ward or in the OR). Seminars with a clinical-practical focus were popular with students.

3.3.3 Work

Students found it useful to carry out clinical tasks such as taking blood, as they perceived a learning success after repeatedly performing them (e.g., taking blood samples from patients with difficult vein conditions without any problems). These routine tasks were only described as enriching if they are not the main activity during the working day (several hours). The PJ students were particularly grateful when they were asked whether they would like to do routine tasks or whether they had enough time at that moment instead of simply being told to do them.

"There were also two or three [blood samples] per day that the blood collection service didn't manage, or the patients were not in their rooms at the time. And that was nice, because you had some routine, but you didn't have to take blood from 20 patients. That really surprised me in a positive way."

“I was allowed to examine and document the patients by myself and then I received feedback when I asked for it. I think that’s really good because you actually learn something when you make mistakes.”

“And that was really great in the outpatient department, it was extremely rewarding because I had my own patients there and I was able to talk about it before and after, either with an assistant doctor or sometimes even with the senior doctor, and we also discussed how to proceed and what other diagnostic issues I would consider.”

The PJ students expressed different opinions about their desired scope of responsibility. Some PJ students were happy to have more responsibility for patients (e.g., registering examinations, initiating treatment, writing doctor's letters). Other PJ students found it relieving to have little or no responsibility.

Students were grateful for every increase in knowledge and the opportunity to work independently in clinical practice.

3.3.4 Organization

A clearly defined medical contact person or PJ representative was perceived as an organizational resource for PJ students. The hospital's PJ representative takes care of all organizational issues (e.g., regarding rotation plans) and problems of the students, while the permanent medical teaching doctor/mentor of each department is responsible for the teaching and supervision of the individual student and works closely with them.

“There are several levels of PJ representatives. There is someone who takes care of organizational matters. She is from the secretariat, she is also PJ representative. Then there is the medical one, i.e., the senior doctor, who is also involved and then there is an assistant doctor, who in fact comes to the ward from time to time. And this person also talks to us about how things are going, coordinates patients, discusses it with us and has a lot of contact with us overall. And it’s really motivating to know that someone is keeping an eye on you. And tells you: ‘If things aren’t going well, if someone doesn’t treat you well, please tell me.’ So that there is someone who says: ‘If anything goes wrong, I’m there for you and we’ll find a solution.”

It was seen as a resource when students received clear guidance from supervising doctors and mutual expectations, e.g. regarding work and learning success were exchanged at the beginning of the tertial.

3.3.5 Social interaction

Students described intra- and interprofessional interaction between doctors and between doctors and nursing staff as positive if cooperation and communication with them seemed to be non-hierarchical and if the interaction was friendly and respectful.

Students also appreciated when supervisors and colleagues valued their work.

"Especially when it's about vein accesses, blood sampling or bandage changes. We've done a lot that wasn't actually our job, but we liked doing it because we want to learn it. And we were able to really support the nursing team and do a lot of their work, and they were so thankful, really appreciated it and were very kind and friendly."

Students were grateful when they received constructive feedback from their supervisors so that they could continue to improve in their work. Assistant doctors often integrated the students into the team and involved them in the contribution of daily tasks, which PJ students viewed as positive.

"I think especially assistants who have not been working for so long have a better connection to PJ students, they also try to integrate them more, give them more tasks. I would say this is because they remember their time as PJ students and know better what it was like. One of the assistants practically convinced me to start working there after all, because I was able to work like that. And I was really included and these were very positive experiences."

The relationships among PJ students were perceived as a resource, especially during the initial period, because experienced PJ students could introduce new ones to key tasks or programs (including software) or introduce them to new activities. The division of routine tasks was perceived to significantly reduce the workload for students. PJ students understood that there was little room for questions in stressful situations or when there was a high workload. They also comprehended that nursing staff might show little interest in PJ students, as they rotate to the next department after a few weeks. They understood that they were expected to perform a high number of monotonous routine tasks when staff is missing. According to the PJ students, supervisors knew that the students received low pay for their work, which is why they let them go home early sometimes.

3.3.6 Time

PJ students did not perceive overtime as disruptive if they enjoyed their work, gained practical experiences or knowledge and received time off as a compensation. The number of working hours per week acceptable to students with a subjectively perceived intact work-life balance showed strong between-student variation. It was perceived as helpful, if PJ students were able to make arrangements concerning their work time with supervisors or other PJ students (e.g., leaving earlier in case of other appointments or swap shifts with other students). This was

particularly helpful for students with children, as they may have had to take them to or pick them up from daycare or school. PJ students found it particularly positive when supervisors offered them the opportunity to go home earlier when the work situation was quiet or allowed the students to decide for themselves when their shift ended.

PJ students felt relieved when their supervisors were indulgent regarding the formal absence regulations. Some of them discussed vacation and sick days within the department with their supervisors and did not have to take any official days off, which was appreciated and which also became evident in the stressor section.

Voluntary night shifts were perceived positively by the students, as they were much better supervised by the one-to-one teaching and were allowed to work independently more often, which is associated with greater learning gains.

"Night shifts were also helpful because we had one-to-one teaching there. I really liked that and I would definitely keep mandatory night shifts for PJ students. You have some really interesting cases there and you get the chance to examine patients yourself right away, and you also feel like being part of the team."

"I have done a couple of shifts and I liked it because you were with a senior doctor and an assistant or with two assistants at times. They showed you much more, they also guided you way better. I was able to do about ten compression ultrasound examinations. And they were also supervising it and I could do it myself with each of the patients and that's so useful. Because then, you can really do it and I thought that was really cool."

3.3.7 Finances

PJ students were pleased to receive an allowance, even if it is small. Additional paid night shifts were viewed positively by PJ students. Furthermore, students who had completed part of their final year in Switzerland reported that the pay there was significantly better than in German hospitals. PJ students who received BAföG felt grateful and relieved as they have no financial worries thanks to the state support. Another resource for students was the financial support e.g. from their parents or partner.

"Luckily, my parents support me financially, and they still do that even though I receive compensation. So this means I don't have any financial trouble even though I don't earn much money."

Some PJ students received monthly financial support through a scholarship (e.g. [Deutschlandstipendium], foreign scholarship). This enabled the PJ students to complete part of their PJ abroad without having to worry about financial matters. PJ students who live in a shared flat or with their partner found this a financial relief.

3.3.8 Personal matters

PJ students felt most motivated in their elective tertial, as they were usually most interested in their clinical area of choice and may complete this part of their PJ in the hospital where they wanted to work as a junior doctor after their final examination. Students took the opportunity to make important contacts in this time, e.g., for their application (especially superiors) and tried to make a good impression on staff (e.g., through extensive preparation of ward rounds and/or overtime). On the other hand, hospitals also seemed to recognize the opportunity to present themselves as an attractive employer and thus recruit new employees.

"It's an individual issue, but I think it's calming to know that becoming a doctor is the right thing for me. You just have to choose the right medical specialty and it's good that there are also very nice superiors who don't yell at you for making a mistake. So, that you're really allowed to make mistakes."

"I think you really want it to start now. But this is actually what the PJ is about. You should feel adequately prepared so that you want to start working and also know how to do the job."

The experiences of the students during the PJ seemed to be highly relevant for the upcoming choice of their specialization after the M3 and the choice of hospital as their first employer. Some students who already knew before the PJ which specialist training they would like to start felt encouraged by positive experiences. Others gained new insights in that they liked a specialty better than they had expected (e.g. fun at work, motivated teaching doctors, integration into the team) with the consequence that they changed their desired choice of specialty. Some students were negatively surprised (e.g. unfriendly colleagues and more overtime, night shifts and administrative tasks such as telephoning). They reconsidered and changed their desired choice of specialist as a result. Some students reported that they were so impressed by the positive working environment in specific departments, among other things, that they wanted to apply there after graduation, even if it was not their first choice for a department.

A summary of the psychosocial resources of the students can be found in the following table.

Table 3: Psychosocial resources of the PJ students

Learning/working atmosphere	• Fun at work • Forbearing supervisors who are patient • Room for questions • Room for mistakes
Teaching	• Seminars/further training (including intermediate examinations), PJ teaching • Students can express their own interests and make suggestions regarding the content of PJ sessions • Supervision: support, instruction/guidance, challenges and encourages, commitment/initiative, interest in learning success, one-on-one teaching/mentoring
Work	• Tasks: learning/knowledge gain, routine tasks, interesting tasks • Time-efficient work processes • Independent work: taking on/helping with work, practical work, own patients, preparation for career start • Routine • Suitable workload • Responsibility: allowed to take responsibility or little/no responsibility
Organization	• Clear guidelines/expectations for PJ students • Work clothes • Break room with fruits • Medical contact person/PJ representative • Division and structure of the tertial: rotations, structured training program, ward capacities (1-2 PJ students per department)
Social interaction	• Groups of people: doctors, patients/relatives, fellow PJ students, inter- and intraprofessional interaction • Resources: good cooperation, good atmosphere, team integration, flat hierarchies, communication, understanding
Time	• Night shifts/shift work: one-on-one supervision, voluntary offer/ compensatory days off • Regulated break times • Working hours: flexible start/end of shift • Working without time pressure • Goodwill with regard to absence regulations • Regular study days
Finances	• Compensation for expenses/remuneration • Free meals in the hospital • BAföG (state financial support for students with limited financial means) • Parents/partner for financial help • Scholarship • Shared costs/shared flat
Personal matters	• Motivation/interest: PJ clinic as potential first employer • Retrieving and applying knowledge and skills • Career choice/choice of specialist area: anticipation of career start, confirmation, new knowledge • Positive work-life balance
Technologies	• Device introduction • Own telephone • Own workstation

3.4 Proposed improvements

3.4.1 Teaching

PJ students were in favor of the introduction of practical training (e.g., an introductory sonography course and a refresher course on the most common examination techniques in small groups) and theoretical seminars (e.g., concerning emergency situations).

“I think that the PJ classes could be optimized. I would focus a bit on practical training and something like introduction to devices. So that you really get some training, no matter if it’s the sofware “Mediko” or some medical devices like dialysis machines; there were no introductions and you just stayed away from everything, or you always had to ask others for help. And it would have been nice if you had had more guidance.”

They would like to get to know diseases interactively with the appropriate diagnostic and therapeutic procedures using patient case examples. PJ students would like to have structured PJ lessons with predetermined dates, times, lecturers and topics discussed. PJ students would find seminars on topics such as dealing with stress, workloads, death and dying as well as conflict situations with patients, supervisors and/or colleagues particularly useful.

“You have so many PJ seminars about content-related things, I think it would be good if there were also a few other things like how do I deal with stress, how do I deal with death, how do I deal with workload, how do I deal with unfriendly colleagues.”

"I mean, I've been to an ethics seminar. They also talk about death and dying. But places are limited and it's once every six months. I think it would be really cool to have something like that on offer."

They also welcomed the opportunity to be in charge of their own patients during the PJ (from admission to discharge), as they were convinced that this responsibility allows them to significantly develop both personally and in terms of their skills.

Students would also appreciate one-on-one teaching or a mentor in the department who feels responsible for teaching and caring for the student and who works with them. A fixed mentor, with whom the student works closely over several days or weeks, could possibly better assess the student's competences and accordingly entrust him with more tasks and allow him to work more independently than is the case with frequently changing medical supervisors.

“More like a mentor, exactly. So that when I’m on the ward and I have one or two patients I take care of, that there is another person talking care of them with me, someone who gets a bit involved and with whom you can exchange information. In other words, a designated

contact person who also teaches you something, who guides you through things and shows you how everything works."

The students would like to receive more feedback, e.g. in the form of interim discussions with their mentor.

"That there is somehow a responsible doctor with whom you actually sit down every two weeks or at least once at the beginning and with whom you can talk and say, for example, this and that is not going so well or this and that is going well and who then also tries to improve it."

They believe that better preparation of teaching staff, e.g. with regard to didactic and methodological skills, would be useful.

3.4.2 Work

PJ students suggested a fixed place to go in case they experience emotional stress. They would like to be able to talk openly about stressful situations and receive professional support, e.g., from the hospital counseling (e.g., once a month).

"I would like to have certain groups where you can also bring cases that affected you in a way; that is also often missing in the clinic for the doctors. And I think this would be actually cool, […] because it's also the first time you come into contact with these issues."

"If that's what you want, that you are somehow given the space to simply exchange ideas. Because I think that's an important aspect that shouldn't be forgotten. Sometimes you get the feeling in day-to-day life on the ward that you have to somehow stand over it and not think about things. But I think if you do that for years, it will catch up with you at some point. That's why I think it's important, even in the final year, when you're just starting out in your practical time and on the ward, that you also somehow manage or simply deal with difficult situations or borderline situations, that you also get time for that."

After tense, hectic or stressful situations (e.g., after unsuccessful reanimation), PJ students would like a team-time-out of 5-10 minutes in which the situation could be discussed and analyzed retrospectively.

"I would like to see a very short team time-out after a resuscitation, for example. It only needs to be for five minutes or for everyone to sit down together and say "OK, how did that go?" Also professionally. Can we optimize the processes? Especially if it turns out to be fatal. And maybe even say "Okay, how are you?" It's not just about someone asking me "How are you doing now?" I mean, that would be nice, of course, but it's about asking how people are actually doing. And I think there's still very little room for that in hospitals."

3.4.3 Organization

PJ students believed that the communication of supervisors' expectations as part of an information event or a discussion with the responsible supervisor at the start of the rotation in the new department is beneficial and could prevent misunderstandings. The students themselves could also express their expectations and learning objectives in this context.

“I would have liked to have a conversation at the beginning of the PJ with one of the senior physicians or someone else who is responsible for the students. So that this person tells you about their expectations, what they think your job is and what they want you to do. But also, that the PJ student can talk about his or her wishes.”

PJ students suggested an appropriate distribution of students (not more than two per ward) in order to minimize competition between students.

In addition, they would like to have fixed rotation schedules and more individual opportunities to help shape the organization of PJ tertials. There is an individual desire for more or sometimes less time to be spent on compulsory subjects (internal medicine and/or surgery). In addition, some students would like a second elective rotation, so that either the elective tertial is divided into two halves (2 months each) or tertials are replaced by quarters in one special field (internal medicine, surgery and two electives of 3 months each).

The role and function of PJ students should be made better known to the general population in order to facilitate contact with patients by increasing their trust in students.

"When I introduce myself or when I'm introduced, people always use different names for me. So “Yes, this is another student here” or “Yes, this is a final-year medical student.” They never actually say PJ student. [...]. I don't think the patients know what function you really have, how much you are allowed to do. [...]. So when doctors introduce me, it also influences how they relate to the patients. [...], if they introduce me and tell them “Yes, this is a student” then they might be afraid “Oh God, now they're going to let a student loose on me [...]”. And I think if it was clearer how much we are allowed to do or how well we are supervised, then that would make such situations easier. And you would also feel more validated."

The nationwide standardization of the PJ in terms of compensation, working hours per week and study days was also suggested by the participants.

“If I could decide, I would standardize the PJ nationwide. Because I think it’s really annoying that, within the same city, you sometimes get paid, or you don’t get paid at all. Sometimes, you are supposed to work nine hours, sometimes six. […] It is completely random with regard to study days, payment and procedures. And I would try to standardize it so that it’s fair for everyone. Because I think someone who earns no money and has to work five days in a row

is stressed on a whole different level compared to someone who gets a lot more money and has several study days, for example. Yes, I think I would standardize that."

Students suggested establishing a fixed employment contract for PJ students. This should include the fixed weekly working hours and break times, rotation schedules and the expense allowance.

3.4.4 Social interaction

Students would like to be more integrated into the ward team (e.g., staff knowing the students' names) and to be involved in the division of tasks.

They also pleaded for more feedback during the PJ (e.g., constructive feedback from the responsible teaching doctor at least once a week).

3.4.5 Time

Students appreciated the opportunity to take part in night shifts, which should be voluntary though in their view. Students would want the number of 5-6 weekly working hours per day to be set in the study regulations, and hospitals should also adhere to that or allow for the division of hours. They suggested either working 5-6 hours per day on five days of the week or keeping the regular working hours of resident physicians on four days of the week and then receiving one compensatory day per week (e.g., as a study day).

"I think there should be more regulations on how much a PJ student is supposed to work. And everyone should also adhere to these regulations then. I mean, if you're doing something that's really interesting and if you're doing it voluntarily, that shouldn't be a problem. But there are still cases in which the PJ student is being completely exploited so to say."

Regarding the absence regulation, students suggested separating sick days from vacation days. This would imply 30 vacation days with additional sick days (with a doctor's certificate) if necessary. In addition, the students would like 20 days of fixed study time between the end of the PJ and the third state medical examination.

"I think there should be vacation days and also sick days, just like for all other employees. So, that you need to bring a doctor's certificate when you're missing for more than three days in a row, for example. But you shouldn't have any disadvantages because of that, and sick days shouldn't be counted as days of absence."

"So there has to be the option of being sick. That can be with a medical certificate if you take sick leave. And I don't mind if you're just sick non-stop, then you have to make up for it by saying, okay, there's some kind of upper limit or minimum that you have to have been there.

Yes, and the rest has to be covered in the exam or whatever. Or you have to take some smaller intermediate oral exams so that it's clear that you've learned something."

3.4.6 Finances

PJ students also demanded a higher allowance that corresponds to the minimum wage or is at least at the salary level of an apprentice. In addition, according to PJ students, the expense allowance should be standardized nationwide.

“First of all, I would demand that PJ students get more money and second, that everyone gets the same amount of money, because I think this isn’t fair at all.”

"And I think it would be good if it were standardized, so that everyone had the chance to concentrate on their final year and had a salary that would enable everyone to get through their time in a reasonable way. I would definitely change that. Better pay, or more pay, more money."

3.4.7 Technology

Students would like to be trained in using technological devices. This includes PC software and medical devices such as sonography devices, ventilators and dialysis machines.

Also, they would like to have their own workstation with a PC including access to necessary PC software (e.g., for the registration of examinations, for patient files, doctor's letters and in-house e-mails/messages).

“Right now, I would like to have more access to, let’s say, all the different programs. I’d probably need to have three or four access points so that I could do some things more independently. I think it would be cool to consider PJ students so that we don’t have to beg for access to a computer. Instead, we should just be able to access everything, and everything should be working. So that you could also take better care of your patients or think about them better. And simultaneously, you could be supervised and talk about it with the doctors.”

"It would also be nice to have your own workplace, of course. You don't have a permanent job and you only have very, very limited access. I think that's a shame and also difficult. Because you can't use your full potential because you can't use the programs. For example, I couldn't improve my skills in writing letters to doctors because I can't get into the program. In other words, I couldn't even try my hand at it."

A summary of the mentioned solutions suggested by the PJ students and the corresponding stressors can be found in the following table.

Table 4: Comparison of stressors and solutions proposed by PJ students

	Stressors	**Proposed solutions**
Learning/working atmosphere	• Lack of appreciation/ recognition • No collegiality/ lone wolf mentality • Quarrels/ blasphemies • Bad manners/ harsh tone • No room for error • No room for questions/ uncertainties	• More appreciation from superiors, nursing staff and patients
Teaching	• PJ Teaching/ Courses: Structure, format, commitment, timing/ scheduling, topics, absences • Catalog of learning objectives • Supervision: medical contact person/ supervisor, no demands and support, lack of training	• Practical lessons instead of frontal teaching • Application-related topics of the PJ teaching lessons • Stress management seminars • Interactive PJ teaching • Structured training program (all PJ students receive the same teaching and are no longer dependent on the commitment or goodwill of the supervising teaching physicians) • Preparation and skills seminars • Care for own patients (admission to discharge) • Predefined learning objectives, e.g. in the form of voluntary logbooks or catalogs of learning objectives • Fixed medical contact person in case of problems (one per ward) and fixed person responsible for teaching (control of the learning objectives to be archived) • One-on-one-teaching/ mentoring • Better formation and training of supervising teaching staff (dealing with students, their integration into the ward team, general conditions

		of the PJ such as working hours per week, tasks and learning objectives in the PJ) • More initiative in the part of teachers (more frequent assumption tasks)
Work	• Emotional stress: death/ passing away, no contact person/ preparation • Work content: non-medical activities, no increase in learning/competence, administration/organization, routine tasks • Work processes: interruptions, inefficient/ time-consuming processes • Lack of skills and knowledge: practical uncertainties, technical/ theoretical uncertainties, fear of making mistakes, recalling knowledge/ putting theory into practice • No/ little independent work: changing supervisors, running behind/ sitting around, no patients of their own, poor preparation for career start • Workload: high workload, low workload • Scope for action: fear of disadvantage in M3, too much responsibility, too little responsibility	• Contact point for emotional stress, voluntary offer, e.g. once a month, open exchange, e.g. led by hospital pastoral care • Take on exclusively medical activities (no errands, patient transportation, and nursing tasks) • More time to get to know work processes (accompaniment of a permanent supervisor during the initial period) • More responsibility and trust from superiors and therefore more opportunities to work independently • Stronger integration into everyday working life with firmly assigned tasks • Regular team meetings (so called team-time-out)
Organization	• Bureaucracy • No clear guidelines: no employment contract with a clear number of working hours/ week • Lack of work clothes • Ward capacities (sometimes up to 7 PJ students per department) • Rotations: new staff/ supervisors, new environment	• Communication of the duties and rights of PJ students (e.g. tasks and working hours) • Communication of supervisors' expectations as part of an information event or a discussion with the responsible supervisor at the start of the rotation in the new department • Employment/ internship contract with clearly defined working hours/week, rotation schedule and expense allowance

		• Distribution of PJ students: max. two per ward • Rotation schedules: rotations every 4-8 weeks (individual) • More opportunities for co-design/ flexibility in the allocation of PJ tertials (desire for more or less time in a compulsory subject; desire for a second elective subject (internal medicine, surgery and two elective subjects) • Standardization of the PJ in terms of compensation, working hours/ week and study days • Make the position and function of final year students better known to the general public • Cross-clinic advocate for final year students
Interpersonal relationships	• Groups of people: Nursing staff, doctors, patients/relatives, PJ students, interprofessional interaction, intraprofessional interaction • Contents: team integration, hierarchy, communication, expectations too high	• More team integration (e.g. knowing the names of the PJ students) • More feedback in the PJ: e.g., constructive feedback from the responsible teacher at least once a week
Time	• Night shifts/ shift work • Lack of break times • Working hours: Working on weekends/ public holidays, early start of shift, no daylight, overtime/ late end of shift • Working under time pressure • Absence regulations • No study days	• Offer of voluntary night shifts • Clearly defined break times with colleagues (exchange) • More flexible working hours by relieving routine tasks, e.g. through a blood collection service • Spreading and adherence to the fixed working hours per week according to the study regulations (5-6h/day) or a fixed study or compensation day per week • Absence regulation • More time for teaching, specialist training,

		preparation and follow-up of topics during the PJ
Finances	• Expense allowance • Part-time job • Living expenses and rent	• Higher compensation for expenses: Minimum wage or at least at the salary level of a trainee or intern
Personal matters	• PJ clinic as potential first employer • Fears/worries about the future regarding the upcoming choice of specialist and work as a junior doctor (responsibility, overtime, shift work) • Commuting • Doctorate • Physical and mental stressors • Character traits • Negative work-life balance	
Technologies	• Working with machines/programs • No own workplace	• Introduction to equipment (including PC program and medical equipment) • Own workstation with PC incl. access to necessary PC programs (e.g. registration of examinations, patient files, doctor's letters and internal e-mails/messages)
Other	• Staff shortage	

4 Discussion

4.1 Summary of findings

The present study was conducted to explore the experienced stressors, available resources and proposed improvements of PJ students during the transition from mainly theoretical studies to clinical-practical training.

Mentioned stressors included a lack of skills and knowledge, poor supervision (i.e., lack of interest in learning success), routine tasks (i.e., lack of learning experiences due to repetitive work), lack of appreciation and a heavy workload. Some factors could be perceived as both a stressor and resource depending on their manifestation and/or each PJ students' preference. These factors were the quality of professional interaction with nursing staff and doctors, the degree of responsibility assigned, the level and number of assigned tasks and the working hours per week as well as the desired number of weeks spend on a ward (rotation plans).

4.2 Findings in light of prior research

Of the models of general stress research mentioned at the beginning of the introduction, the transactional stress model according to Lazarus [8, 14] could be substantiated by our empirical data: PJ students experience stress when they primarily evaluate a situation as challenging (e.g., due to the transfer of a subjectively too high expectation or responsibility on the part of the supervising physicians such as looking after a ward while the physicians were operating) and secondarily evaluate that the resources available to them are not sufficient to cope with the situation (e.g., due to the feeling of a lack of skills and knowledge, lack of time for familiarization). In this case, the students perceive the situation as a stressor.

In order to compare our data with Seyle's General Adaptation Syndrome, the study participants would have to be observed for longer, as according to this model stress presents itself as a three-stage response of the body to stressors: first the alarm reaction (fight-or-flight with increased heart rate, cortisol and adrenaline release), then the resistance stage (recovery after stress reaction with normalization of heart rate and drop in cortisol level) and, in the case of persistent stressors, the exhaustion stage (fatigue, anxiety disorder, depression, burnout) [3]. We cannot even compare the alarm reaction with our study results, as we did not examine the biological reactions of the students to the stressors they experienced. It is therefore not possible to compare our results with the General Adaptation Syndrome.

A longer observation period of the study participants would also be necessary to be able to make statements about the model of allostasis and allosteric stress according to McEwen, as allostasis refers to long-term adaptation mechanisms of the organism to chronic stress and the

model of allosteric stress states that the overstraining of an organism by repeated or chronic stress reactions leads to various health problems such as chronic pain [6, 7]. As our data was collected at a single point in time, no statement can be made about the comparison with the allostasis and allosteric load model.

According to Hobfoll's Conservation of Resources theory, stress occurs when important resources are lost, threatened or not adequately gained after resource use, leading to a spiral of loss [17, 18]. Our results show that PJ students can experience a loss of resources, particularly in energy, due to overtime and monotonous activities. At the same time, there is a lack of social recognition if the student receives little appreciation or feedback from superiors. In addition, there is the threat to personal resources such as doubts about one's own competence and the worry of being poorly prepared for later professional life if students are not allowed to take on responsible tasks. In addition, the expected gain in resources fails to materialize because, despite the effort and time invested, there are hardly any learning opportunities or no targeted support or professional or personal development. This can trigger a spiral of loss: the persistent exhaustion reduces motivation, which has a negative impact on performance, as a result of which the student receives even less recognition. The perceived stress increases further. Suitable coping strategies in this case would be mentoring by a supervising physician to strengthen social resources (appreciation, integration into the team) with feedback discussions and concrete learning opportunities (personal resources such as self-confidence and motivation), as well as defined working hours (energy resource; protection against exhaustion).

Our results are also consistent with previous qualitative and quantitative studies among medical students (including PJ students) [88, 89]. Stressors such as a persistent lack of time on the part of the supervising doctors (including lack of support, guidance, supervision and feedback [22, 63, 75, 82]), and negative emotions (e.g., stress, anxiety, frustration and fear) elicited by taking on the role of a doctor [91] were described. Contact with pain, death and suffering [23] as well as competitive thinking between medical students [64] were also reported by medical students. The PJ students´ role conflicts (e.g. "What is a PJ student? What is a PJ student allowed to do? Where does a PJ student stand in the hospital hierarchy?") that we identified were also seen in a previous study [88].

PJ students in our studies also seemed to experience some stressors that have been described to be more salient among resident physicians, such as high work demands (workload, inefficient tasks, responsibility), concerns about patient care, poor work environment (relationships at work, supervision and support, lack of feedback) and poor work-life-balance [47] as well as lack of control [41].

As described above, there are a large number of stressors that have already been described for medical students and resident physicians, some of which partially overlap with those for PJ students, but some may be unique. Unique stressors mentioned for the first time by PJ students in our study include inadequate compensation for work performed, strict absence regulations, the lack of a uniform structure in the training program, and the fact that there is no fixed learning period between the end of the PJ and the Third Medical State Examination.

The resources included working with patients and their appreciation, a positive learning and working atmosphere, learning and knowledge acquisition, one-on-one supervision or mentoring by a physician in the ward with regular feedback sessions, practical training as well as a positive work-life balance with sufficient leisure time.

Our collected data on psychosocial resources are consistent with Lazarus' transactional stress model and the emotion- and problem-oriented coping strategies [13-15]. PJ students in our study also sought social support from their friends and family as well as from supervisors and other PJ students (emotion-oriented coping). They also utilized previously acquired skills (problem-oriented coping) and were grateful for learning successes (e.g., drawing blood from patients with difficult venous conditions). As has already been shown in previous studies, people with strong social networks are less psychologically burdened by stress factors [19]. For PJ students, the relationship with other PJ students, especially in the initial period, is an important resource (introduction to key tasks or programs and emotional support). Just as shown in previous studies [21], our participants also perceived financial support from their partner, parents or in the form of BAföG or a scholarship as a resource. This enabled them to complete parts of their studies abroad without worrying about finances.

Our findings are also consistent with previous qualitative studies among medical students (including PJ students). These include a supervision-oriented training curriculum with a defined contact person, a mentoring program, a distinctive feedback culture [22, 63] as well as committed and supportive teaching doctors [22], teaching with good didactic approaches and active learning methods [23] and patient contact [23, 64].

The PJ students in our study suggested a structured training program with interactive case-based learning in preparatory or skills seminars. Previous studies on interactive case-based learning showed that this learning tool contributes to the expansion of students' knowledge and demonstrably improves performance results in the Objective Structured Clinical Examination (OSCE), which is a method of examination that allows a standardized, reliable, and objective evaluation [117]. Practicing clinical case studies in dermatology, combined with reflection and feedback, has been found to be superior to a lecture-based approach in terms

of medical students' ability to evaluate skin lesions (diagnostic accuracy) [104]. A previous study in the form of an on-call simulation on a hospital ward reported that integrated learning and dealing with negative emotions can be useful in helping PJ students feel better prepared to begin their careers as resident physicians [91]. A contact point for psychological stress and seminars on dealing with negative emotions and challenging situations in the PJ were urgently requested by interviewed PJ students. Our findings show that students want to carry out delegable medical activities more independently and be given the opportunity to care for their own patients under supervision. A pharmacist-led prescribing program in which PJ students made prescriptions, received interprofessional feedback from clinical pharmacists and took part in prescribing and calculation exercises, improved the students' confidence and prescribing skills [78, 79]. To ensure high quality teaching, it is essential to increase the establishment and frequency of training programs for examiners and PJ supervisors [118].

Students in our study would like to have a permanent contact person for problems and permanent medical teaching doctor in terms of one-on-one teaching or mentoring. In order to be able to offer a one-on-one mentoring program, additional staff is of course required. As the establishment of such a mentoring program on each ward is time-consuming and costly for the teaching hospitals, its introduction seems unrealistic for the time being. However, research has confirmed that it is well received by PJ students and allows teaching to be tailored to student expectations and interests [93]. A mentoring program with regular feedback may improve the practical medical skills and might better prepare PJ students for their future work as resident physicians [94]. Students need support from teaching physicians in reflecting on their actions, behavior and experiences with patients. [119].

The students in our study wished for more feedback during the PJ (e.g., constructive feedback from the responsible teacher at least once a week). A prior study found that training with feedback from peers, standardized patients and a trainer resulted in a significant improvement in the medical students' self-assessment of their communication skills [120]. Video-based supervision, in combination with feedback from supervisors, can be an effective tool for improving clinical training in medical education [121]. This approach can help healthcare professionals develop and apply empathic and relational skills [122]. Video-based feedback sessions during patient contact could be included in the final year training curriculum as they seem to boost the self-esteem and confidence of PJ students. [123]. However, teaching doctors would need to make additional time for the regular feedback sessions with students.

Currently and in the coming decades, 3 to 4 generations of doctors will work together in clinics (Baby Boomers (*1946-1964), Gen. X (*1965-1980), Gen. Y (*1981-1995) and Gen. Z (*1996-2010)) [124]. The topic of "generational change in the workplace", i.e. the cooperation between the different generations and their partial view of work as well as the resulting demands on organizational structures and management styles, is becoming increasingly important. More

experienced doctors (e.g., from the Baby Boomers) criticized less experienced doctors (e.g., from Generation Y) for their lack of motivation, resilience, commitment and initiative [124-126]. ,Doctors from Generation Y criticize a lack of understanding on the part of the more experienced for their idea of working hours and the balancing act between family and career [124]. Our findings showed that PJ students (Gen. Z) were motivated to work overtime if they experienced learning success (mean working hours/week= 37.1 instead of 20-25 hours/week officially specified in the study regulations). PJ students described in the interviews that their work-life balance as a lower priority, as they could hardly wait to start their career as resident physician so that they could really get going. This confirms the results of a previous study in which final-year students rated themselves highest in the competence area “Motivation” [84].

Interestingly, some of the suggestions that were made by participants in our study correspond to the four main demands of the Federal Representation of Medical Students in Germany (bvmd):

1) nationwide minimum compensation equal to the maximum BAföG rate (934€/ month),
2) separation of sick and vacation days,
3) four weeks of study time before the Third Medical State Examination and
4) a structured training curriculum with uniform teaching standards (including a mentoring program with regular feedback meetings, care for own patients under supervision, designated responsible physicians with experience, at least four hours of teaching per week and at least eight hours of self-study per week).

With the "Fair Practical Year" campaign medical students throughout Germany are currently campaigning for the medical licensing regulations to be amended. A total of 4,200 students demonstrated in the summer of 2023 for better conditions in the PJ and over 102,000 signatures were collected as part of an online petition [127]. This underlines the current importance of changing the working and training conditions in the PJ from the perspective of students and the population as a whole.

4.3 Strengths and Limitations

One of the strengths of this study was the recruitment of participants from different age groups and genders. In addition, the students were spread across many different specialties. The working week varied between 26-46 hours per week. These factors increase the likelihood that we were able to capture a wide range of possible opinions and experiences. One limitation, however, was that the generalizability of our findings is limited as all participants were students at the HHU, but worked in different hospitals at the time of data collection. Some topics may therefore relate to specific conditions at teaching hospitals at our university (e.g., working conditions, compensation, teaching). However, the results of previous qualitative research in Germany and our study were similar, which indicates a partial transferability across PJ students in different medical schools in Germany.

It is possible that only students who experience increased stress took part, because they were more interested in the research question. However, it could also be that students who are not overly stressed took part, because they might have had more time. Data collection by individual interviews is a strength of our interview due to the increased anonymity in contrast to focus groups and thereby the better opportunities to raise unpleasant and sensitive topics (e.g., fears) or to express criticism.

The members of the research team with experience in qualitative research gave SF the best possible introduction and prepared her for the data collection and analysis. As part of her medical studies, SF had already gained some experience through internships, so she may have jumped to assumptions about resources, stressors and proposed solutions and asked less in-depth questions.

To gain insights into potential bias, the content analysis was carried out by two independent members of the research team (LG and SF) who worked intensively with the material. All four members of the research team, who have different backgrounds (AL: health scientist, TM: psychologist, LG: English Studies and Literary Translation and SF: medical student) reviewed data several times and critically discussed the results. SF has a personal interest in future improvements and the implementation of the proposed solutions, as she will be a PJ student herself in the future.

4.4 Recommendations for practice and research

Substantial demographic shifts are anticipated to affect not only the economy and social structures but also health systems, the organization of healthcare services, and the development of health policies in high-income countries such as those in Europe [128]. Compared to previous generations, improved living conditions, declining smoking rates, reduced alcohol consumption, and further advances in medical care make a continued increase in life expectancy likely in the medium term. In Germany, a slight increase in the total fertility rate is expected by the year 2035. This assumption is based, in part, on the expectation that some of the births postponed due to the COVID-19 pandemic will be made up. Additionally, increased immigration following the end of the pandemic could temporarily lead to a rise in birth rates [129]. However, demographic change has led to a decrease in the proportion of children and adolescents, while the share of the older population has increased, resulting in a growing demand for age-specific health services [130, 131].

Furthermore, the worldwide shortage of healthcare professionals is concerning. According to the World Health Organization (WHO), nearly 14 million healthcare workers including nurses, doctors, midwives, and other health professions will be lacking globally by the year 2030 [132]. The key factors influencing the intention to leave include fear related to COVID-19, age, professional experience, symptoms of burnout, and the level of support received. A meta-analysis revealed that approximately one third of nurses and physicians reported an intention to leave their current position, and about one quarter expressed an intention to leave the profession altogether [133]. However, existing literature indicates that healthcare workforce shortages are largely fueled by demographic shifts, rising healthcare demands, and an increasing prevalence of chronic illnesses among the population [134].

PJ students in our study reported also working on understaffed wards or departments and noted the impact of staff shortages on their training such as reduced time for patient contact, teaching, and meaningful engagement with available learning opportunities. Providing the best possible education and training during the final year of medical school and residency, along with ensuring high job satisfaction and retention among PJ students, physicians, and other healthcare professionals, should therefore be a central priority for individual hospitals, the federal states, and the national government in order to ensure optimal patient care in the future. Key factors influencing job retention included job satisfaction, opportunities for career advancement, and a healthy work-life balance. Recognizing these elements is essential for designing multifaceted interventions that can inform healthcare strategies and enhance workforce retention [134].

Optional preparatory courses for the practical year, such as those offered at the University Otto-von-Guericke Magdeburg [92], would address the intervention needs expressed by our study participants regarding practical training, for example, in common examination techniques and thereby facilitate the start of the practical year as well as reduce the practical uncertainties and fear of making mistakes of the students.

A mentoring-based educational curriculum with clearly defined competencies as learning objectives, regular workplace-based assessments and evaluations of clinical practical skills (in form of Mini-CEX), as well as structured feedback during regular meetings with the mentor (every two weeks), as implemented in the anesthesiology PJ rotation at Leipzig University Hospital [63], in neurosurgical PJ rotation at University Hospital Tübingen [93] and during the PJ at Jena University Hospital and teaching hospitals [94], enables structured learning support through supervision and fosters the acquisition of clinical and practical skills. Study participants reported the need of predefined learning objectives (e.g., in the form of voluntary logbooks or catalogs of learning objectives) and application-related topics of the PJ teaching lessons.

Our study participants suggested better formation and training of supervising teaching staff (e.g., dealing with students, their integration into the ward team, tasks and learning objectives in the PJ). In a mentoring program at University Hospital Tübingen, all mentors involved had either completed or were currently undergoing training at the University's Center for Teaching and Learning. Furthermore, each mentor possessed adequate experience in educating medical students [93].

PJ students in our study shared their fears and concerns about their future work due to feeling poorly prepared for the start of their careers as junior doctors. These concerns could be alleviated through mentoring-based curricula and prescribing programs, as PJ students in such programs felt significantly better prepared for practical work after completing their studies compared to control groups [78, 79, 94].

Our study participants expressed the need for information regarding the framework. The website "PJ-input" consolidates information about the final year (Registration, deadlines, organization, teaching, next steps after the PJ, ...) to support students in the teaching-learning process [96].

The PJ students' desire for more responsibility and trust from superiors and therefore more opportunities to work independently in daily clinical practice can be addressed through the implementation of EPAs (Entrustable Professional Activities). These are components of authentic medical activities that can be gradually entrusted to students, providing both students and supervising physicians with guidance on the progressive assumption and delegation of responsibility [96, 97].

Over the past few years, various proposals have been made at different political levels in Germany to improve the working and training conditions during PJ, particularly with regard to standardized compensation and adjusted regulations for permissible absences [135-138].

In Saxony-Anhalt, the PJ compensation at the university hospitals in Magdeburg and Halle was increased to match the maximum BAföG rate as of April 1, 2024 [139]. Furthermore, as part of the pilot program “PJ Saxony-Anhalt is fair,” the deans of both medical faculties are advocating for adequate study time before the M3 examination, adjustments to the regulations on permissible absences, and nationwide standardized training conditions during the PJ [139].

In December 2024, the coalition agreement between the CDU and SPD for the 8th legislative period of the Saxon State Parliament included the implementation of a standardized compensation for the PJ across the entire state. Additionally, revised regulations regarding sick leave and permitted absences were agreed upon, along with a minimum interval of four weeks between the end of the PJ and the third state examination [140].

In the new coalition agreement between the CDU, CSU and SPD for the 21st legislative period at the end of March 2025, it was stated that a nationwide adjustment of the PJ allowance to the BAföG level and a fair and uniform absence regulation will be sought. Structured training in the form of the master plan for medical studies is supported [141].

The “Master Plan for Medical Studies 2020” outlines changes to the structure of medical education and its curricular content. Teaching is increasingly oriented toward the development of practical, physician-related skills. The National Competency-Based Learning Objectives Catalog for Medicine (NKLM) provides a framework for competency-oriented and science-based medical education designed to prepare students for their future roles as physicians. General practice is further emphasized within medical training. The admissions process is being modernized by placing greater emphasis on social and communication skills as well as strong motivation to study medicine. As a measure to safeguard healthcare provision in rural areas, the federal states are granted the option to implement a so-called “rural physician quota.” Under this provision, states may allocate up to 10 percent of medical school places in advance to applicants who commit to working in primary care in underserved or at-risk rural regions for up to ten years following completion of their studies and residency training in general medicine [142].

Concrete implementation at the national political level has not yet occurred, highlighting the need for continued political engagement. Public advocacy should be maintained to raise awareness of the working and training conditions during the Practical Year (PJ). The representation of PJ students' interests should be further strengthened. All federal states, together with the respective universities and their affiliated university hospitals and academic teaching hospitals, have a duty.

The findings of our study can be used to improve the working and training conditions in the final year (student-centeredness in relation to the design of the final year) and to develop interventions. Adjustments are necessary to reduce the stress of PJ students and to improve the training situation in the PJ. Changes to the framework conditions of the PJ are also essential for this. These could not only contribute to an improvement in clinical training, but also to staff recruitment and retention.

The results of this study should serve as a basis for further quantitative research to quantify and prioritize areas of intervention and for experimental studies to test measures to improve the PJ experience for students. The validity of our findings should be tested for other sites within and outside Germany.

4.5 Conclusion

Our qualitative study illustrates the stressors and the psychosocial resources experienced by PJ students and suggested starting points for interventions (e.g., organization and structure, teaching and supervision, and financial compensation). The findings of our study help to better understand the views and needs of PJ students during their transition to residency training and show which measures are preferred by PJ students. Hospitals that accommodate or fully implement these measures could be perceived as attractive employers by newly graduated physicians.

Further measures need to be taken at a political level in order to improve the working and training conditions in the PJ in the future. This might be one way of counteracting the shortage of doctors in hospitals.

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6 Appendix

6.1 Interview guide

“The practical year: a qualitative study on stressors, resources and proposed improvements among medical students“

A study by the Institute for Occupational, Social and Environmental Medicine at Heinrich Heine University Düsseldorf

1. Welcome

Hello and welcome. First of all, I would like to introduce myself: My name is Syna Franck and I am a medical student in my 10th semester at Heinrich Heine University and a doctoral candidate at the Institute of Occupational, Social and Environmental Medicine at the University of Düsseldorf. Thank you very much for participating in this interview.

2. Aim of the study

In this study, I would like to investigate the burdens and negative aspects as well as the positive experiences in the PJ. I am also interested in what you would improve or change.

At this point, it is important to say that there are no right or wrong answers. You are free to express your personal experiences, assessments and opinions.

The interview will take about 30 minutes.

3. Confidentiality and anonymization of the data

All data collected here will be treated in accordance with the current version of the General Data Protection Regulation. The conversation will be recorded on a tape recorder. I will NOT address you by name during the interview so that you remain anonymous. The tape recording will be transcribed afterwards by an external service provider and then destroyed immediately. Any information you provide about places or names (e.g., superiors) will NOT be recorded. The external service provider is subject to a confidentiality agreement.

You can end this interview at any time and without giving reasons. This will not result in any disadvantages for you.

4. Declaration of consent

I have received your declaration of consent. Have you received the document "Proband Receipt"?

5. Questions?

Do you have any questions before we get started?

I will turn on the tape recorder now and record a code at the beginning. This code will allow us to assign the interview later without your name.

6. **Switch on the dictation machine and record the code!**

To begin with, I would like to ask you a few questions about yourself.

Gender	**male**	**female**	**diverse**
Year of birth (Age)			
Semester			
Specialty of the current rotation			
Location of the current rotation			
Working hours/ week, including overtime			

How often have you felt affected by the following complaints in the last 2 weeks? (PHQ2 + GAD-2)	**Not at all**	**On single days**	**On more than half of the days**	**Almost every day**
Little interest or pleasure in your activities	1☐	2☐	3☐	4☐
Dejection, melancholy or hopelessness	1☐	2☐	3☐	4☐
Nervousness, anxiety or tension	1☐	2☐	3☐	4☐
Not being able to stop or control worries	1☐	2☐	3☐	4☐

Interview questions

Introductory question about everyday working life	**Please describe your current typical working day in the PJ!** How have you experienced the PJ so far?
Stressors	What stresses you in your day-to-day work? What stressors have you experienced during your PJ? Have you experienced any emotional stress?
Resources	What positive experiences have you had? What resources have you used during the PJ?
Coping	What helps you personally to deal with the stress of the PJ?
Proposed solutions	What would you like to change if you had the opportunity? What changes would you like to see?
Final questions	What expectations did you have of the PJ? Were they fulfilled? What surprised you positively and negatively? How has your PJ influenced your choice of specialist?

7. Conclusion of the interview

From my point of view, we are done with the interview now. Finally, is there anything else you would like to say or add?

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8. Thank you for participating

We are done with the interview now. I would like to thank you very much for talking to us! I will now stop the tape recording. Could you give me some final feedback? How did you experience the interview? What was positive and were any aspects missing?

9. Final reflection

Duration of the interview:

Atmosphere of the interview:

Conspicuous/special features:

What should be taken to the next interview/adapted?

Note: Each interview was introduced with an open introductory question and concluded with a final question. The purpose of these questions was to establish a trusting relationship with the participants and to provide an opportunity to address all topics relevant to them. However, these questions are not the focus of this paper and are thus not further elaborate

7 Table of figures

8 Acknowledgments

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