BMC Nursing

RESEARCH Open Access

Associations between key job resources, job demands, and affective organizational commitment among nursing professionals in German hospitals: a cross-sectional study

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Abstract

Background Hospitals in industrialized countries like Germany face persistent shortages of nursing professionals, making staff retention through affective organizational commitment essential. However, factors associated with this commitment among nursing professionals in German hospitals remain understudied. Guided by affective events theory and the job demands-resources model, this study examines the associations between key job resources, job demands, and nursing professionals' affective organizational commitment in general wards.

Methods To investigate the relationships between job resources and demands and affective organizational commitment of nursing professionals, this study employed a cross-sectional survey. The dataset for analyses comprised 312 nursing professionals working in general wards in Germany and was analyzed using multiple linear regression.

Results The investigated variables explained 44% of the variance in nursing professionals' affective organizational commitment. Fair and authentic management was positively associated with affective commitment, while work overload and inadequate remuneration showed negative associations. No significant relationships emerged for other examined job resources, such as supervisor support or job autonomy, or for job demands like work-life interference.

Conclusions These findings align with theoretical perspectives suggesting that specific job resources and demands may play a role in nursing professionals' affective organizational commitment. Based on the observed associations between job resources and demands and affective organizational commitment, this study offers considerations for hospital management. Three areas might warrant management attention: cultivating fair, authentic, and moral leadership practices among nurse managers; systematically mitigating work overload; and ensuring attractive remuneration packages. Future research, particularly longitudinal or experimental studies, is needed to further investigate the causal relationships underlying the observed associations.

Keywords Affective organizational commitment, Job resources, Job demands, Nursing professionals, Nursing management, Hospital management

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Background

Nursing professionals hold key roles in hospitals. They are expert healthcare providers, patient-centered caregivers, key partners in the healthcare team as well as patient educators and advocates [1]. Their scope of practice includes pivotal direct patient care activities. They also perform essential operational and strategic activities, such as coordinating care, supervising collaborators, and contributing to healthcare practices within their organizations [2–4].

However, hospitals in industrialized countries like Germany are facing a severe shortage of nursing professionals and are challenged by high vacancy and turnover rates [1, 5–7]. This entails substantial costs for recruitment, onboarding, and training of new employees and temporary replacements, impedes organizational learning, and diminishes patient satisfaction and quality of care due to understaffing [8–11]. In response to the shortage of nursing professionals, the retention of current nursing staff has therefore become a key priority for hospital management, alongside efforts to recruit new employees [5, 8].

There is consensus in research that nursing professionals' commitment to their hospital plays an important role in this context, as organizational commitment has been shown to contribute to retention [9, 12, 13]. Though the concept of organizational commitment continues to be debated in the literature [e.g., 14–17], most definitions focus on a positive psychological bond between employees and their organization [14, 18, 19]. In the three-component model most prominent in the literature [17], organizational commitment is conceptualized as an internal force that binds an individual to an organization and consequently to a course of action of relevance to that organization [20]. The binding force can be characterized by three mindsets [21]. Continuance commitment reflects an employee's need to remain with an organization based on cost-benefit considerations. Normative commitment refers to an individual's perceived obligation to stay with that organization. Affective organizational commitment (AOC) denotes an employee's emotional attachment to, identification with and involvement in the organization and thus the desire to belong to that organization [21].

Numerous studies have pointed to AOC as "core essence" [22] of organizational commitment since it has been found to be particularly powerful in predicting employees' retention [23–27]. In addition, AOC has been found to be positively associated with other outcomes critical to hospital success like employees' job performance and organizational citizenship behavior [23, 24]. In nursing, recent research found AOC to be also favorably related to nurses' work engagement [28], thriving at work [29], boundary spanning behaviors [30], and innovativeness [31].

Consequently, it is vital to understand the factors associated with nursing professionals' affective organizational commitment. Related research for employees in general is extensive and has identified a variety of antecedents comprising employees' individual characteristics, organizational characteristics and work environment features [14, 15, 18, 24, 32, 33]. Research in the nursing domain is somewhat less extensive, but numerous factors have also been examined for nursing professionals in different settings including hospitals [34, 35]. Recently, attention has particularly focused on the relationships between nurse managers' leadership and nursing professionals' AOC. Cumulative evidence was found, for example, that a transformational leadership style could be positively related to the AOC of nursing professionals [36–40]. Positive associations were also found to some extent between the AOC of nursing professionals and authentic management [41] as well as supervisor support [19, 42, 43]. Furthermore, recent studies suggest that autonomy [19, 43, 44], peer support [19, 30] and the availability of adequate work resources [44] may be positively related to nursing professionals' AOC. Current studies suggest the same for adequate compensation [44, 45] and advancement opportunities [44, 46]. On the other hand, recent studies imply that work overload [45, 47, 48] and work-life interferences (e.g., due to nightshifts and unhealthy work schedules) [49, 50] may hinder the emergence of AOC in nursing professionals.

Despite valuable contributions, existing research on AOC among nursing professionals exhibits three notable limitations. First, there is a *theoretical gap* in that many studies lack a clear theoretical framework guiding the selection of investigated factors related to AOC. While various factors have been examined, a sound theoretical rationale for their inclusion and a thorough theoretical embedding is often missing, which hinders developing a coherent understanding of AOC antecedents and advancing theory [51, 52].

Second, a *methodological gap* exists in prior research. Most studies examine associations between AOC and potential related variables in isolation rather than jointly. While individual studies typically analyze one or only few variables, this approach prevents understanding both the unique associations of each variable and their combined relationships with AOC when controlling for other factors [53].

Third, a *contextual gap* can be identified, as research on AOC among nursing professionals in German hospitals remains scarce, despite the high number of nurses employed in this setting [54]. While studies such as Miedaner et al. [19] and Klingenberg and Süß [55] have explored AOC in Germany, their scope is limited– the former focuses exclusively on nurses in neonatal intensive care units (NICUs), a highly specific subgroup, while

the latter examines resilience as a single antecedent of AOC. As a result, there is limited knowledge about the factors related to AOC among nursing professionals in German hospitals, particularly those in general wards, where the majority of hospital-based nursing staff in Germany are employed [56].

Research aim and contribution

This study addresses these gaps by adopting a structured theoretical framework. It integrates Affective Events Theory [57] with the job demands-resources model [58]. This framework enables a systematic examination of associations between job resources, job demands, and AOC. Through this approach, we ensure a more theoretically informed selection of examined factors than in prior research. Additionally, rather than focusing on individual factors in isolation, this study simultaneously investigates multiple job resources and demands to capture both their unique associations and combined relationships with AOC. This multivariable approach aligns with the job demands-resources model, which advocates examining job resources and job demands jointly rather than in isolation [58]. Moreover, by specifically focusing on nursing professionals in general wards in German hospitals, this study contributes to filling the contextual gap.

Beyond contributing to the academic literature, the findings aim to provide insights for nursing management, highlighting factors that may be relevant for strengthening AOC.

The next section outlines the conceptual framework and selection of job resources and demands examined in this study.

Theoretical framework

To investigate factors potentially associated with nursing professionals' affective organizational commitment, we draw on Klein and colleagues' [14] process model of commitment. This model posits that affective organizational commitment depends on how nursing professionals perceptually evaluate key organizational and work environment characteristics of their hospital. Affective Events Theory [57, 59] serves to further elucidate these perceptual processes. It suggests that a hospital's organizational and work environment features may contribute to AOC both directly and indirectly. Directly, a hospital with favorable features may be cognitively evaluated as deserving dedication and involvement. Indirectly, AOC may emerge in response to affective events within the organization. Organizational and work environment features may elicit positive or negative work events that trigger corresponding affective reactions in nursing professionals, which in turn may cumulatively influence affective organizational commitment over time. Klein et al. [15] recently underscored the importance of positive affects towards the commitment target in contemporary workplaces.

To determine potential candidates for the key organizational and work environment features of a hospital in the formation of AOC of nursing professionals, the job demands-resources model can be relied on [58]. It assumes that any organizational and work environment can be characterized by specific job demands and resources. Job demands denote physical, psychological, social, and organizational aspects of a job requiring sustained physical, cognitive, and / or emotional effort. Job resources refer to physical, psychological, social, or organizational aspects of a job that are functional in achieving work goals, regulate the impact of job demands, and stimulate learning and personal growth. While certain job demands and resources such as workload or social support may be common across work settings, others may be unique to specific environments [58].

In an integrative review, Broetje and colleagues [60] have identified six key job resources and three key job demands particularly relevant to the organizational and working environment of nursing professionals. The key job resources include, first, the *autonomy* to make work-related decisions and exert control over one's own work. Second, *professional resources*, which enable nursing professionals to perform their duties effectively, include both tangible resources such as working equipment and intangible resources such as access to information or task organization. Third, *interpersonal relationships* refer to supportive, respectful, and appreciative relationships with other nursing professionals. The other three key job resources relate to aspects of leadership: *Supervisor support* refers to social support by direct superiors (e.g., encouraging feedback or emotional support), while *fair and authentic management* denotes ethical leadership behaviors reflecting values like fairness, trust, and integrity. Finally, *transformational leadership* focuses on leading nursing professionals through change. This leadership style encompasses inspiring (e.g., envisioning change), individualized (e.g., listening to nursing professionals' concerns and needs), exemplary (e.g., acting as a role model) and intellectually stimulating (e.g., encouraging innovative thinking) leadership behaviors. Among key job demands, *work overload* refers to work and time pressure and inadequate staffing. *Work-life interferences* denote conflicts between work and private or family life, such as being required to change private plans due to work obligations. Lastly, a *lack of formal rewards* refers to unfair remuneration and insufficient development and advancement opportunities.

Building on these considerations, we hypothesize that the affective organizational commitment of nursing professionals is associated with their perceptual evaluation of these job resources and demands, which constitute key

organizational and work-environment features of their hospital. Figure 1 displays the proposed research model.

Methods

Study design

An analytical cross-sectional study design was adopted to examine the associations between the key job resources and demands and the affective organizational commitment of nursing professionals. Data were gathered via a structured questionnaire with measures that have demonstrated validity and reliability in previous research. Since all questions were asked in German language, we employed measures that were well-established in German-speaking countries. The survey was conducted online using the web-based platform SoSci Survey. A pretest performed prior to data collection did not indicate that content-related or technical adjustments would have been necessary. Data were collected between April and June 2023.

Participants

State-certified nursing professionals authorized to hold the titles "general nurse", "healthcare worker and nurse", "healthcare and pediatric nurse", or "geriatric nurse" were eligible for study participation. Eligible individuals had completed vocational or university training as mandated by the German legislations and were actively employed in general hospital wards in Germany, with a minimum age of 18 years.

Excluded were professionals working in higher levels of care like intensive care units and functional areas like operating theaters or anesthesia. Individuals in training, nursing (specialist) assistants, nursing managers, and other non-bedside care personnel were also excluded. Moreover, those employed in other healthcare settings such as psychiatric or rehabilitation clinics, geriatric care facilities, or outpatient care services were excluded.

The study is based on a convenience sample. Since there is no national register for nurses in Germany, 480 hospitals– 30 from each of Germany's 16 federal states– were randomly selected from the directory of the German Hospital Federation (DKG) to recruit participants. The hospitals' nursing directors were invited to distribute the survey link to the target group by round mail and a prepared information poster for the wards. Second, the survey link was sent to the two German nursing chambers as institutions of nurses' self-administration and to ver.di as trade union for the nursing profession with the request to forward it to their members in the target group. Third, the link was shared via the Instagram and Facebook accounts of the "Springer Pflege" information

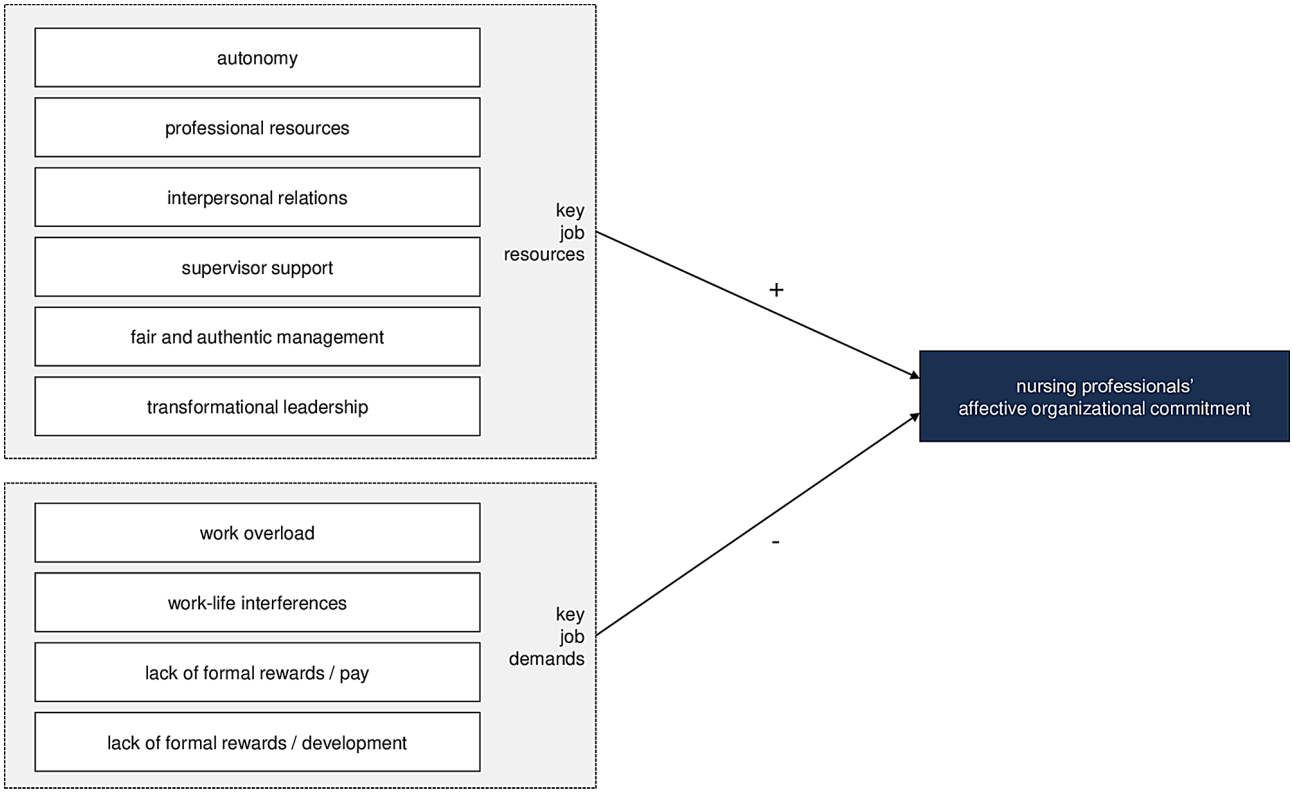

Fig. 1 Proposed research model. Note: The figure shows the theoretical causal structure. Given the cross-sectional study design, findings represent associations rather than causal effects [61–64]

portal for nursing professions and in nursing-related WhatsApp groups.

Measures

Affective organizational commitment. To measure the affective organizational commitment of nursing professionals as the dependent variable, the 5-item OCA (organizational commitment affective) subscale of the Commitment Organization, Occupation and Form of Employment Questionnaire (COBB) was used which has shown good reliability and validity [65]. An example item was "I would be very happy to spend my further working life in this hospital". The items were measured on a 5-point Likert scale ranging from "does not apply" to "fully applies" with higher values indicating greater commitment.

Job resources. The 3-item autonomy subscale of the Questionnaire for Psychosocial Work Risk Assessment (FGBU) [66, 67] was used to measure the degree to which nursing professionals can choose how they carry out their work (*autonomy*). An example item was "I have a lot of freedom in the way I do my job". The items were assessed on a 4-point Likert scale from "not correct at all" to "fully correct".

Professional resources were captured with the 3-item work resources subscale of the Employee Key Figures Questionnaire (MIKE) [68]. An example item was "I have sufficient work resources at my disposal to effectively perform my work task". Participants rated their level of agreement with each item on a 4-point Likert scale ranging from "strongly disagree" to "strongly agree".

Interpersonal relations with nursing peers and *supervisor support* were measured with the social support by coworkers and social support by supervisor subscales of the Salutogenetic Subjective Work Analysis Questionnaire (SALSA), which showed adequate psychometric properties [69, 70]. The subscales consisted of three questions each, which the participants had to answer once referring to their colleagues and once referring to their supervisor. An example is "How much can you rely on the following people if problems occur at work?". The questions could be answered on a 5-point Likert scale ranging from "not at all" to "absolutely".

Fair and authentic management was operationalized with the 4-item trust and justice subscale of the German version of the Copenhagen Psychosocial Questionnaire (COPSOQ), which demonstrated adequate psychometric properties [71, 72]. An example item was "Is the work distributed fairly?". All COPSOQ-items were answered on a 5-point Likert scale ranging from "to a very small extent" to "to a very large extent".

Finally, *transformational leadership* was measured using the German 12-item short version of the Transformational Leadership Inventory (TLI) [73–75]. Example items were "The person I describe paints an interesting picture of the future for our working group" and "The person I describe leads by 'doing' rather than simply by 'telling'". All items were measured on 5-point Likert scales from "never" to "always".

For all measured job resources, higher numerical values indicated a more favorable resource allocation.

Job demands. The 4-item quantitative workload subscale of the Questionnaire on Psychological Stress in Inpatient Nursing (miab), developed by the German Accident Prevention and Insurance Association for the Health and Welfare Service Sectors, was employed to measure *work overload* [76]. An example item was "One nurse is responsible for too many patients". The items were measured on 5-point Likert scales ranging from "no, not at all" to "yes, exactly".

Work-life interferences were assessed using the 3-item work-life balance subscale of the Employee Key Figures Questionnaire (MIKE) [68]. An example item was "Contact with my friends and acquaintances repeatedly suffers from my irregular work hours." Participants rated the items on a 4-point Likert scale ranging from "does not apply" to "applies".

We assessed the *lack of formal rewards* using two separate instruments. The first instrument measured insufficient pay, while the second evaluated lack of advancement opportunities [60]. Remuneration was measured with the 2-question satisfaction with pay subscale of the Job Diagnostic Survey (JDS) [77] adapted to German language [78, 79]. An example question was "How satisfied are you with the degree to which you are fairly paid for what you contribute to this hospital?". The questions could be answered on a 7-point Likert scale ranging from "extremely dissatisfied" to "extremely satisfied". We measured development and growth opportunities with the 2-item benefits subscale of the Short Questionnaire for Workplace Analysis (KFZA) [80, 81]. An example item was "Our hospital provides good training opportunities". The items were measured on a 5-point Likert scale ranging from "does not apply at all" to "applies completely". All JDS and KFZA items were reverse coded so that higher numerical values corresponded to a greater lack of formal rewards. For all measured job demands, higher numerical values thus indicated higher demands.

Baseline data and control variables. To characterize the sample and account for potential confounding factors, the participants' gender, age, and qualification level were recorded. As further controls, it was included whether the respondents worked full-time or part-time, worked in shifts, and for how many years they had worked for their current hospital.

Bias and data quality

Potential study participants were asked screening questions to verify inclusion criteria. To address common method bias concerns, we adhered to Podsakoff et al.'s [82] recommendations for procedural remedies. The questionnaire was divided into sections, with brief instructions provided between each section to separate the measures. We used varied response scales and scale point labels, following the original instruments, to mitigate potential method bias from common scale properties. To alleviate tendencies to respond in a socially desirable manner, respondents were guaranteed anonymity. Participants were also able to answer the survey at home or in any other protected area. To increase respondents' motivation to provide accurate answers, the instructions elucidated that the data could contribute to a better understanding and inform efforts to improve the working environment of nursing professionals. In addition, the questionnaire was kept as concise as possible.

As respondent anonymity was prioritized to encourage participation and mitigate social desirability bias, duplicate prevention methods like IP address storage or access codes [83, 84] were not implemented. To address potential multiple submissions from repeat responders, we conducted a two-stage post-completion data review process. First, we screened for near-duplicate response patterns using (a) pairwise Euclidean distance calculations and (b) the maximum percent match method [85]. For (a), we z-standardized all 44 substantive rating items and computed pairwise Euclidean distances between respondents' standardized responses. Response pairs with a distance below 3.3– corresponding to an average difference of 0.50 standard deviations per item– were flagged as near-duplicates. For (b), we calculated the maximum percent match, defined as the highest percentage of items that an observation shares with any other observation. Respondents with a match of ≥ 80% were also flagged for further manual review [85]. Additionally, we manually reviewed all survey data to identify any further data similarities [83, 84, 86]. Identified near-duplicates were excluded from subsequent analyses.

Study size

The necessary sample size was determined by a power analysis using G*Power (Version 3.1.9.6 for Mac). To measure the combined effect of all independent variables, we used Cohen's f^2, in line with standard practice in multiple linear regression analyses [87]. It corresponds to the proportion of variance explained by the independent variables divided by the residual variance ($f^2 = R^2 / (1\text{-}R^2)$). Following Cohen [87], $f^2 = 0.02$ denotes a small effect, $f^2 = 0.15$ a moderate effect, and $f^2 = 0.35$ a large effect. Based on previous research on factors associated with affective organizational commitment in the nursing field [e.g., 35] and beyond [e.g., 18, 24], it seemed reasonable to consider a medium effect. Therefore, an expected effect size of $f^2 = 0.15$ was set for the power analysis. Based on an error probability of $\alpha = 0.05$, an effect size of $f^2 = 0.15$ and a target power of $1\text{-}\beta = 0.80$, the power analysis for the planned multiple linear regression with 23 independent variables indicated a necessary sample size of 166 respondents.

Statistical analyses

R V4.3.2 and RStudio V2023.06.1 + 524 were used for all analyses. Initially, the data set was cleaned by removing all cases that did not meet the inclusion criteria. Next, we analyzed whether the missing data adhered to the missing completely at random (MCAR) assumption. Using the MissMech R package, we performed Jamshidian-Jalal's test. The results (Hawkins test $p < 0.001$; non-parametric test of homoscedasticity $p = 0.15$) did not provide sufficient evidence to reject the MCAR assumption. Under MCAR conditions, excluding cases with missing data does not bias results [88]. Therefore, we removed cases with missing data. Additionally, we screened for near-duplicate responses. Following this, the sample structure was described, and the means, standard deviations, correlations, and Cronbach's alphas of the study variables were calculated.

Using multiple linear regression analysis, the associations between key job resources and demands and the affective organizational commitment of nursing professionals were examined. Prior to the main analysis, the assumptions of the regression analysis were tested using the Performance and Car R packages. Linearity between the dependent variable and the predictor variables was assessed with the residuals against fitted values plot and partial residual plots of the predictor variables. The plots showed only minor deviations from linear relations. Since the maximum value of the variance inflation factor, 2.70, fell below the recommended threshold of 10 [89], there were no indications of collinearity concerns. The inspection of the histogram and Q-Q plot did not reveal any evidence of a violation of the normality assumption of residuals. The Shapiro-Wilk test ($p = 0.32$) also indicated that the residuals appear as normally distributed. The inspection of the scale-location plot and the Breusch-Pagan test ($p = 0.25$) did not indicate heteroscedasticity. In the outlier analysis using Mahalanobis Distance (threshold = 51.18) [90] and Cook's Distance (threshold = 1) [91, 92], no participants were identified as outliers. Thus, we proceeded with the analysis of the regression model. Categorical control variables were converted into dummy variables so that they could be considered as independent variables in the regression. To represent a variable with j categories, j-1 dummy variables were included in each case. All independent

variables were entered into the regression equation simultaneously.

We used Cohen's f^2 to evaluate the strength of the overall association between all independent variables and affective organizational commitment. The values of 0.02, 0.15 and 0.35 were considered indicative of small, moderate, and large effect sizes, respectively. To classify the strength of associations between individual job resources and demands and affective organizational commitment, standardized regression coefficients were employed. Absolute values below 0.2 were considered indicative of small associations, while values between 0.2 and 0.5 were indicative of moderate associations, and values above 0.5 were considered indicative of strong associations. A p-value < 0.05 was considered significant.

Results

Participant data

In total, 695 responses were collected. Of these, 373 responses were excluded as they did not meet the previously described inclusion criteria. Of the remaining 322 responses, 10 were excluded due to missing values (MCAR assumption supported, see Methods section). No near-duplicate responses were identified using either the Euclidean distance method or the maximum percent match approach, and a manual review of the data found no further similar response patterns. The final sample thus comprised $N = 312$ nursing professionals. Table 1 presents the characteristics of the sample.

Table 1 Characteristics of the sample

	%	*n*
Gender		
Male	12.8	40
Female	86.2	269
Diverse	1.0	3
Age (years)		
≤ 25	17.9	56
26–35	34.6	108
36–55	39.4	123
≥ 56	8.0	25
Qualification		
No further (specialist) qualification	43.6	136
Further (specialist) qualification	43.9	137
Academic degree	12.5	39
Working time		
Full-time	61.2	191
Part-time	38.8	121
Shiftwork		
No shiftwork	5.1	16
Shiftwork without night shifts	16.3	51
Shiftwork including night shifts	78.5	245
Tenure (years)		
≤ 2	16.3	51
3–5	26.0	81
6–10	21.5	67
11–20	16.0	50
≥ 21	20.2	63

Note: $N = 312$

The sample corresponded well with the objectives of the study; professionals with diverse backgrounds were represented. The sample characteristics also corresponded with the structure of the population of nursing professionals in German hospitals [56, 93, 94], with younger professionals, individuals with advanced qualifications, full-time and shift workers being more strongly represented.

Descriptive statistics

Table 2 presents the means, standard deviations, complete correlation matrix, and Cronbach's alphas of the study variables.

The multi-item scales had Cronbach's alphas ranging from 0.74 to 0.97, which exceeded the acceptable level of 0.70 [89]. The only exception was the professional resources scale, with a coefficient alpha of 0.68, which was close to this threshold. To further assess the reliability of this measure, we also determined McDonald's coefficient omega as a more general reliability index. The omega value of 0.71 exceeded both the common threshold of 0.70 and the coefficient alpha value. This indicated congeneric items, where coefficient omega equals composite reliability and provides a more appropriate reliability index than coefficient alpha [95]. Hence, the professional resources scale also exhibited acceptable reliability.

In accordance with theoretical considerations, all job resources showed statistically significant positive correlations with affective organizational commitment ($r = 0.26$ to 0.57, $p < 0.01$, see Table 2). These correlations ranged from weak to strong [87]. Consonant with theory, job demands exhibited significant negative correlations with nursing professionals' affective organizational commitment. The correlation coefficients (r = -0.25 to -0.38, $p < 0.01$) implied weak to moderate associations [87].

Main analysis

The findings of the multiple linear regression analysis with nursing professionals' affective organizational commitment as the dependent variable are presented in Table 3. The regression model explained a substantive proportion of the variance in the affective organizational commitment of nursing professionals (adjusted $R^2 = 0.44$, $p < 0.001$). This corresponds to a large joint effect size ($f^2 = 0.79$).

Based on the theoretical considerations, it was expected that there would be positive relationships between the key job resources and the affective organizational commitment of nursing professionals. As hypothesized, fair

Table 2 Means, standard deviations, Pearson's correlations, and Cronbach's alphas of study variables

Variables	Items	Scale	*M*	*SD*	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
1. Autonomy	3	1–4	2.69	0.64	***0.81***																							
2. Professional resources	3	1–4	2.51	0.61	0.20	***0.68***																						
3. Interpersonal relations	3	1–5	3.94	0.74	0.20	0.16	***0.87***																					
4. Fair and authentic management	4	1–5	3.08	0.68	0.30	0.41	0.29	***0.74***																				
5. Supervisor support	3	1–5	3.29	1.02	0.35	0.26	0.32	0.50	***0.91***																			
6. Transformational leadership	12	1–5	3.05	1.00	0.27	0.27	0.33	0.55	0.75	***0.97***																		
7. Work overload	4	1–5	4.22	0.76	-0.34	-0.29	-0.05	-0.30	-0.29	-0.29	***0.83***																	
8. Work-life interferences	3	1–4	2.97	0.72	-0.22	-0.28	-0.11	-0.29	-0.29	-0.23	0.45	***0.80***																
9. Lack of formal rewards / pay	2	1–7	4.30	1.28	-0.24	-0.20	-0.20	-0.37	-0.31	-0.33	0.32	0.35	***0.82***															
10. Lack of formal rewards / development	2	1–5	2.77	1.00	-0.28	-0.17	-0.19	-0.44	-0.41	-0.40	0.15	0.13	0.35	***0.84***														
11. Gender[a]	1	-	0.86	0.35	-0.06	0.01	0.00	0.05	-0.01	0.02	-0.01	-0.13	-0.05	0.06	-													
12. Age ≤ 25[a]	1	-	0.18	0.38	-0.10	0.06	-0.03	-0.04	-0.13	-0.09	-0.05	0.06	0.09	0.03	0.04	-												
13. Age 26-35[a]	1	-	0.35	0.48	-0.05	-0.07	-0.01	0.00	0.09	0.06	-0.01	-0.02	0.06	-0.05	0.00	-0.34	-											
14. Age ≥ 56[a]	1	-	0.08	0.27	-0.01	-0.01	-0.02	0.01	-0.10	-0.04	0.07	0.03	-0.07	0.05	0.05	-0.14	-0.21	-										
15. Qualification: further (specialist)[a]	1	-	0.44	0.50	0.14	0.02	0.12	0.08	0.11	0.05	0.00	-0.08	-0.16	-0.18	-0.04	-0.20	0.02	0.07	-									
16. Qualification: academic degree[a]	1	-	0.12	0.33	0.02	-0.05	-0.09	0.00	-0.01	-0.01	-0.07	-0.03	-0.08	-0.05	0.09	-0.03	0.07	-0.04	-0.33	-								
17. Working time: part-time[a]	1	-	0.39	0.49	0.09	0.05	-0.01	-0.08	-0.06	-0.08	0.00	-0.13	-0.03	0.12	0.07	-0.24	-0.05	0.15	-0.07	0.00	-							
18. Shiftwork: w/o night shifts[a]	1	-	0.16	0.37	0.04	0.08	-0.01	0.12	0.01	0.08	-0.02	-0.01	-0.04	-0.08	0.05	-0.18	-0.05	0.38	0.01	0.10	0.16	-						
19. Shiftwork: no[a]	1	-	0.05	0.22	0.07	-0.07	-0.02	0.02	0.06	-0.01	-0.04	-0.10	-0.07	-0.10	0.09	-0.07	-0.02	-0.02	-0.03	0.18	-0.01	-0.10	-					
20. Tenure ≤ 2[a]	1	-	0.16	0.37	-0.13	-0.01	-0.04	0.07	-0.06	0.01	-0.10	-0.01	0.05	0.04	-0.05	0.27	0.04	-0.10	-0.23	0.04	-0.01	-0.08	-0.10	-				
21. Tenure 6-10[a]	1	-	0.21	0.41	-0.12	-0.03	0.04	0.03	-0.01	-0.05	0.08	0.00	0.03	0.00	-0.02	-0.18	0.32	-0.13	0.13	-0.08	-0.02	-0.06	-0.05	-0.23	-			
22. Tenure 11-20[a]	1	-	0.16	0.37	0.14	0.01	0.00	-0.05	0.11	0.09	-0.07	-0.05	-0.03	-0.06	-0.03	-0.20	0.01	0.00	0.12	0.07	0.12	0.00	0.14	-0.19	-0.23	-		
23. Tenure ≥ 21[a]	1	-	0.20	0.40	0.11	0.08	0.05	0.10	0.03	0.04	0.12	0.07	-0.08	-0.01	0.11	-0.24	-0.37	0.38	0.05	-0.05	0.12	0.30	-0.01	-0.22	-0.26	-0.22	-	
24. Affective organizational commitment	5	1–5	3.27	0.94	0.27	0.32	0.26	0.57	0.45	0.45	-0.35	-0.25	-0.38	-0.37	0.09	-0.08	-0.02	0.00	0.13	0.02	-0.11	0.03	0.07	-0.12	-0.02	0.05	0.20	***0.86***

Note. $N = 312$; M = Mean; SD = Standard deviation; [a] dummy-coded variables: gender 1 = female, 0 = otherwise; comparison category age: 36–55 years; comparison category qualification: nursing professionals without (specialist) further qualification; working time 1 = part-time, 0 = full-time; comparison category shiftwork: shiftwork with night shifts; comparison category tenure: 3–5 years; all $|r| > 0.10$ are significant at the level of 0.05, all $|r| > 0.14$ are significant at the level of 0.01; Cronbach's alphas for multi-item scales are shown in bold and italics in the diagonal in the correlation matrix

Table 3 Results of the regression analysis

	Affective organizational commitment				
	B	**SE**	**β**	***t***	***p***
Independent variables					
Autonomy	-0.05	0.07	-0.03	-0.68	0.500
Professional resources	0.09	0.08	0.06	1.15	0.252
Interpersonal relations	0.07	0.06	0.06	1.18	0.239
Fair and authentic management	0.46	0.08	0.33	5.54	< 0.001
Supervisor support	0.08	0.06	0.08	1.21	0.227
Transformational leadership	0.04	0.07	0.04	0.56	0.573
Work overload	-0.25	0.07	-0.20	-3.74	< 0.001
Work-life interferences	0.03	0.07	0.02	0.37	0.709
Lack of formal rewards / pay	-0.08	0.04	-0.11	-2.10	0.037
Lack of formal rewards / development	-0.07	0.05	-0.07	-1.41	0.159
Control variables					
Gender[a]	0.14	0.12	0.05	1.14	0.257
Age ≤ 25[a]	0.09	0.14	0.04	0.64	0.522
Age 26-35[a]	0.11	0.11	0.05	0.98	0.328
Age ≥ 56[a]	-0.10	0.17	-0.03	-0.61	0.544
Qualification: further (specialist)[a]	0.04	0.09	0.02	0.44	0.660
Qualification: academic degree[a]	0.05	0.14	0.02	0.34	0.737
Working time: part-time[a]	-0.17	0.09	-0.09	-1.87	0.062
Shiftwork: w/o night shifts[a]	-0.21	0.12	-0.08	-1.68	0.093
Shiftwork: no[a]	0.08	0.19	0.02	0.42	0.672
Tenure ≤ 2[a]	-0.18	0.13	-0.07	-1.40	0.164
Tenure 6-10[a]	0.11	0.13	0.05	0.82	0.413
Tenure 11-20[a]	0.28	0.14	0.11	1.99	0.048
Tenure ≥ 21[a]	0.63	0.15	0.27	4.12	< 0.001
Model Statistics					
R^2			0.48		
Adjusted R^2			0.44		
F			11.54		
p			< 0.001		

Note: *N* = 312. [a] dummy-coded variables: gender 1 = female, 0 = otherwise; comparison category age: 36–55 years; comparison category qualification: nursing professionals without (specialist) further qualification; working time 1 = part-time, 0 = full-time; comparison category shiftwork: shiftwork with night shifts; comparison category tenure: 3–5 years

and authentic management was found to be significantly and positively associated with affective organizational commitment (β = 0.33, t = 5.54, $p < 0.001$). The standardized regression coefficient, falling within the range of 0.2 to 0.5, indicated a moderate association. In contrast to expectations, the findings did not indicate significant relationships between the other examined job resources and the affective organizational commitment of nursing professionals. No significant associations were observed between affective organizational commitment and autonomy (β = -0.03, t = -0.68, $p = 0.500$), professional resources (β = 0.06, t = 1.15, $p = 0.252$), interpersonal relations with nursing peers (β = 0.06, t = 1.18, $p = 0.239$), supervisor support (β = 0.08, t = 1.21, $p = 0.227$), and transformational leadership (β = 0.04, t = 0.56, $p = 0.573$).

We performed additional post-hoc analyses of the data to explore the potential role of some factors in more detail. To further examine job autonomy, we explored whether there might have been (a) a non-linear (inverted U-shaped) relationship between job autonomy and AOC or (b) a potential plateau in AOC at higher levels of job autonomy. Regarding (a), we introduced the square of the autonomy measure as an additional variable in the regression model. Regarding (b), we fitted a regression model using a reciprocal term of the autonomy measure. We conducted additional post-hoc analyses to explore whether autonomy was positively related to AOC in two groups: (c) younger nursing professionals (under 25 or 35 years) and (d) academically qualified nursing professionals. These groups might have a higher need for autonomy. However, none of these post-hoc analyses showed significant associations between job autonomy and AOC. Additionally, post-hoc analyses were performed on the data to further investigate the association between interpersonal relationships with nursing peers and AOC. We (e) investigated the possibility of a non-linear (inverted U-shaped)

relationship by including the square of the measure of support from colleagues as an additional variable in the regression model. This analysis yielded no evidence of a curvilinear relationship. In addition, we (f) conducted the regression analysis for the subgroup of nursing professionals under 25 years of age. In this analysis, interpersonal relations were significantly and positively associated with AOC among younger nursing professionals, with a moderate effect size (ß = 0.29, t = 2.30, $p < 0.05$).

Overall, the study data partially supported the presumed associations between the investigated job resources and affective organizational commitment.

From a theoretical perspective, it was further expected that there would be negative associations between job demands and affective organizational commitment. The findings supported this expectation for work overload. Greater work overload was associated with significantly lower affective organizational commitment (β = -0.20, t = -3.74, $p < 0.001$). The standardized regression coefficient, with an absolute value of 0.2, indicated a moderate association. Similarly, insufficient formal rewards in terms of remuneration emerged as a significant correlate of affective organizational commitment. More critical assessments of remuneration were associated with significantly lower affective organizational commitment (β = -0.11, t = -2.10, $p < 0.05$). With an absolute value below 0.2, the standardized regression coefficient indicated a small effect size. Unexpectedly, insufficient formal rewards in the form of growth and development opportunities (β = -0.07, t = -1.41, $p = 0.159$) and work-life interferences (β = 0.02, t = 0.37, $p = 0.709$) were not found to be significantly associated with affective organizational commitment. Overall, the presumed associations between job demands and the affective organizational commitment of nursing professionals were partially supported by the study data.

Discussion

This study aimed to investigate factors associated with the affective organizational commitment of nursing professionals on general wards in German hospitals. Specifically, the objective was to examine whether affective organizational commitment is related to the perceptual evaluation of certain nursing-specific job resources and demands. Our analysis, first, suggests that the key resources and demands proposed by Broetje and colleagues [60] show a substantive joint association with nursing professionals' AOC. Together, the examined factors explained 44% of the variance in AOC, which corresponds to a large effect size ($f^2 = 0.79$). The statistical relationship between these factors and affective organizational commitment appears stronger than that reported for work engagement in the study by Bartsch et al. [96], who explained 36% of the variance in nurses' work engagement using the same variables.

However, second, our study indicates that not all resources and demands designated as 'key' by Broetje and colleagues [60] show significant associations with nursing professionals' affective organizational commitment. Concerning the relationships between nurse managers' leadership and nursing professionals' AOC, our work suggests that fair-authentic leadership is positively associated with affective organizational commitment. This finding is generally in line with prior research in other countries like Japan and Korea that also found nurse managers' fairness and authenticity to be positively related to staff nurses' AOC [41, 97]. However, these prior studies have exclusively focused on the fair and authentic leadership dimension. In contrast, our study examined multiple leadership aspects. The results demonstrate that fair-authentic leadership maintained its significant statistical relationship with AOC when other leadership behaviors were included in the analysis.

Third, the results regarding the other investigated aspects of leadership behavior are noteworthy. We found neither significant associations between supervisor support and AOC, nor between transformational leadership and the AOC of nursing professionals. These results contrast with previous studies that have reported positive associations between commitment and both supervisor support [19, 42, 43] and transformational leadership [36–40]. However, those studies were conducted in other countries and healthcare settings and did not specifically relate to nursing professionals on general wards in German hospitals. It is generally acknowledged that context can have a wide range of effects on the leadership process and its outcomes [98]. The diverging results may, therefore, be attributable to contextual macro- and micro-level factors. Drawing on contextual leadership research [98], future work should thus more thoroughly examine contextual factors, potentially using research designs that can test for moderation effects in the relationship between leadership and nursing professionals' AOC.

Fourth, our analysis found no significant association between job autonomy and the AOC of nursing professionals on general wards in German hospitals. This is noteworthy as prior research has reported mainly positive relations between autonomy and various work-related variables [99] including nurses' AOC [44]. On the other hand, our finding aligns with Miedaner et al. [19], who observed no significant relationship between individual autonomy in work methods and scheduling and the AOC of nurses in German NICUs, the same autonomy aspects examined in our study. Grødal et al. [43] also did not find a significant direct link between autonomy and AOC among nursing home employees in Norway. Research on job autonomy suggests potential

explanations for our finding. Autonomy has been associated with increased insecurity, irritation, work effort and stress [99], which might be related to lower AOC. In this line, some studies found curvilinear relationships between autonomy and work outcomes [e.g., 100–102]. However, our post-hoc analyses provided no evidence of such curvilinear patterns between autonomy and AOC. Furthermore, the relationship between autonomy and AOC might vary with nursing professional characteristics [99]. Previous research suggests that younger and highly qualified employees may have a greater need for autonomy and respond more positively to it [103, 104]. However, our post-hoc analyses did not support different association patterns in these subgroups. It is also conceivable that different aspects of job autonomy show varying relationships with AOC, and aspects beyond those we examined might be associated with AOC. In this vein, Miedaner et al. [19] found positive links between autonomy in decision-making and the AOC of nurses in German NICUs. Given these inconclusive and partly contradictory findings, further research on the role of autonomy in nursing professionals' AOC seems warranted.

Fifth, there was no significant association between professional resources, such as work equipment and information technology, and the AOC of nursing professionals on general wards in German hospitals. We do not consider this finding to contradict previous studies that have determined positive relationships between professional resources and aspects like work engagement [96] or experienced work safety culture [105]. Instead, our result may indicate that professional resources, which are closely connected to daily work activities, might show stronger associations with immediate work-related variables than with organization-related ones like AOC. Another possible explanation could be that not all professional resources, particularly healthcare IT resources, are universally perceived as favorable by nursing professionals [106]. Information systems research indicates that technology can cause adverse affective responses like technostress– a persistent feeling of discomfort with certain technologies [106, 107]. These adverse responses might be negatively associated with affective organizational commitment [108]. As Germany's medical care sector becomes more digital due to legislative initiatives like the Hospital Future Act (KHZG) and the Digital Act (DigiG), further research should examine how IT resources relate to nursing professionals' AOC.

Sixth, our analysis found no significant association between interpersonal relations with nursing peers and affective organizational commitment. The results of Miedaner and colleagues' [19] study, which found positive associations between supportive relationships among nurses and AOC in German NICUs, can therefore not be confirmed for general wards. This discrepancy may reflect differences in working environments, again highlighting the need to consider specific work context conditions when examining relationships between work-environment features and commitment. Nurses in critical care settings face particularly complex, unexpected and emotional situations [19] and may thus particularly require a supportive work environment. This might explain why positive nurse-to-nurse relationships show different patterns of association with commitment in NICU nursing staff compared to general ward staff. However, it could also be possible that our finding reflects an inverted U-shaped curvilinear relationship between interpersonal relations and AOC, similar to patterns found between social support and work engagement [109]. Excessive peer support could threaten nursing professionals' self-esteem [110] or reduce feelings of personal control [111]. Our post-hoc analysis, however, did not indicate such a curvilinear relationship, providing no support for a Too-Much-of-a-Good-Thing pattern relating to peer support. Furthermore, relationships at work may be more important for younger individuals [112], which might explain the lack of significant association in the entire sample. In line with this, we found a significant, moderately positive association between interpersonal relations and AOC among younger nursing professionals in the post-hoc exploration. Given these findings and that our study is an initial endeavor to examine the role of peer relationships in the AOC of nursing professionals on general wards in Germany, further research along these lines is needed.

Regarding job demands, we determined that both work overload and insufficient remuneration showed significant negative associations with nursing professionals' AOC. These findings align with other international studies examining relationships of commitment with work overload [45, 47, 48, 113] and remuneration [44, 45, 113]. Thus, the present study extends previous findings about these associations to the specific context of nursing professionals on general wards in Germany.

Contrary to our expectations, neither insufficient growth opportunities nor work-life interferences showed significant associations with affective organizational commitment. One potential explanation could be that these factors may be particularly important for younger individuals, as suggested by previous studies [112, 113]. However, these factors also showed no significant associations with AOC in our post-hoc analyses of younger nursing professionals. Alternatively, growth and development opportunities might show no relationship with AOC because of low growth and development aspirations, possibly caused by high workloads deterring engagement with growth opportunities [114]. Role frustration [115], stemming from discrepancies between

professional role conceptions and limited factual opportunities for growth and development [113, 116], could also lower aspirations. Further research is needed in this area. The lack of association between work-life interferences and AOC might be related to nurses' strong "sense of duty to care" [117] and a potentially associated willingness to tolerate personal disadvantages. This would raise ethical concerns and point to the importance of a holistic approach to caring for others and oneself [117]. Future studies could investigate this potential explanation.

Finally, in a broader context, our findings contribute to the debate on the redundancy between different job attitudes, particularly the relationship between affective organizational commitment and work engagement [118]. Bartsch et al. [96] examined the same variables we investigated, but focused on their associations with work engagement of nurses in Germany. Comparing both studies reveals more differences than commonalities in how the examined work context aspects relate to AOC and work engagement, respectively. For instance, we found no significant associations between AOC and job autonomy, professional resources, or peer relations, whereas Bartsch et al. [96] found these aspects to be positively associated with work engagement. Thus, our findings provide additional empirical evidence that, although job attitudes like AOC and work engagement may share a common bond [118], they are not redundant as they show different patterns of association with work context factors.

Limitations and paths for future research

This study has limitations. The study employed a cross-sectional design, with the typical limitations for causal inference [61–63, 119]. Due to its design, it can only demonstrate associations between variables, rather than establish causation. Future experimental or longitudinal studies are needed to provide evidence for causal relationships. In this regard, the major transformation of the German hospital sector to be expected in the coming years due to the recently enacted Hospital Care Improvement Act [120] could provide opportunities for researchers to study how changes in job resource and job demand conditions relate to changes in AOC over time.

Moreover, convenience sampling was used, which is inferior to probability sampling, limiting external validity. Despite having nursing professionals from various backgrounds, younger and more qualified professionals were overrepresented in the sample, limiting the generalizability of the findings.

Due to the absence of a national nursing registry in Germany and our multi-channel recruiting approach, the total number of eligible individuals approached could not be determined, preventing the calculation of a formal response rate. While some research suggests a scant relationship between survey response rates and nonresponse bias [121], the inability to assess the response rate hampers evaluation of potential nonresponse bias.

A further limitation relates to potentially clustered data that may have been produced by our sampling approach (e.g., nursing professionals nested within wards, hospitals, and federal states), which can violate the assumption of data independence. Because our analytical approach assumed independence of observations, this may have led to underestimated standard errors, thereby increasing the probability of Type I error [122]. Future research should therefore employ multilevel modeling to account for data dependence, allow for the simultaneous examination of individual- and group-level variables, and assess how relationships might vary across clusters [122]. For instance, building on our research and the work of Miedaner et al. [19], future studies could systematically investigate the role of ward-level variables (e.g., medical specialties), hospital-level variables (e.g., ownership, size, care level), or regional-level variables (e.g., federal state) using multilevel models.

Regarding employment extent, we only collected information on nursing professionals' general employment status (full-time/part-time) without more detailed working hours data, and set no minimum employment threshold, potentially including participants with limited organizational exposure. While employment status was included as a control variable in our analyses, variations in actual working hours could affect experiences of job resources, demands, and AOC.

In addition, the study was conducted online, making it more likely to reach technology-savvy professionals. Committed nursing professionals may also have been more inclined to participate, while high workload might have deterred others. Information biases could exist in recall patterns. More committed professionals may have been more likely to recall positive work events and underlying job resources. Conversely, less committed professionals may have been more inclined to remember negative work events and job demands.

To prioritize respondent anonymity, IP addresses and access codes were not used to identify multiple submissions. Potential multiple responses were addressed through systematic screening of response patterns and manual data review. No suspicious patterns were detected in our sample. Moreover, no participation incentives were offered, reducing motivation for repeated participation [123]. While multiple responses cannot be ruled out, these factors suggest they were less likely to have substantially affected our findings.

Despite using well-established measurement instruments, combining scales from different instruments to measure resources and demands could present a limitation, as they may vary in specificity and depth. Future

work may consider utilizing integrative measurement instruments like the ReA questionnaire [124].

Beyond addressing these limitations, there are further research opportunities. It might be worth exploring the job resources and demands included in this study in more detail. Regarding leadership, e.g., this work relied on Broetje et al.'s [60] distinction of fair-authentic leadership, supervisor support and transformational leadership, which may not be sufficiently discriminatory and exhaustive. Future work could employ Yukl's comprehensive leadership taxonomy to examine the effects of task-, relations-, change-oriented, and external behaviors on AOC [125]. It could also be valuable to further explore the role of different professional resources, especially AI applications. AI could increase AOC by handling less-desirable documentation and administrative tasks, allowing nursing professionals to focus on more meaningful work. However, AI could lower commitment if it impairs perceived job autonomy, carries significant error risks, or if nursing professionals lack the skills to use it effectively. Future studies could also incorporate additional job resources and demands, such as interprofessional relationships with physicians and other healthcare professionals [126, 127]. Including private and personal demands and resources [58] may also be beneficial. Besides, there may be variations in how job resources and demands relate to AOC among different subgroups of nursing professionals on general wards. Further studies could focus on heterogeneity and perform subgroup or moderator analyses based on factors like gender, age, qualification, or general ward type. Given the global importance of this study's topic, future research could also analyze the investigated relationships in other countries to further generalize the current findings.

Conclusions

Based on the observed associations between work environment factors and AOC, this study offers considerations for hospital management. Our findings indicate that nursing professionals' AOC shows significant associations with their perceptual evaluation of three specific job resources and demands. The standardized regression coefficients suggest varying strengths of these associations, which could inform management priorities.

While future research using longitudinal or experimental designs is needed to establish causal relationships, our findings suggest several areas that might warrant management attention. Among the examined factors, fair and authentic leadership practices of nurse managers showed the strongest association with AOC among nursing professionals on general wards in German hospitals. This suggests that cultivating fair and authentic, or more generally, moral leadership practices [125, 128] might represent a strategic priority. Hospitals might consider examining their selection and promotion processes for nurse managers, with attention to identifying individuals with favorable attitudes toward ethical behavior and ethical self-control [129]. When considering candidates for nursing management roles, moral values such as integrity, humility, fairness and justice could be emphasized [125]. Leadership training programs could focus on supporting nurse managers' attitudinal and control beliefs regarding ethical behavior [129] and addressing common ethical issues on general wards [130]. Given that authentic leadership emphasizes self-awareness and moral self-concordance [128], programs might also consider ways to support nurse managers' moral freedom.

Second, the observed negative association between work overload and AOC suggests that workload management might be another important area for consideration. This relates to ongoing political efforts to improve the healthcare system through sufficient funding and legal initiatives, such as the German regulation for determining required nursing staff in hospital care (PPBV) [131]. This regulation specifies the determination of actual and target staffing levels using the PPR 2.0 nurse staffing tool and is to be supplemented by regulations on achieving target staffing levels. Research suggests that while no specific nurse staffing tool has demonstrated clear advantages, the implementation of such tools is associated with higher staffing levels, which might help address workload concerns [132, 133]. At the organizational level, analyzing the specific drivers of nursing professionals' work overload could provide valuable insights. Such analysis might help identify tasks across direct care, indirect care and non-patient care that could be unnecessary or more appropriate for other healthcare team members [134, 135]. This information could then guide workload management initiatives. Additionally, digital technologies [136], proactive managers addressing workload issues [137], and improved interprofessional collaboration [138] might contribute to a more balanced workload.

Finally, our findings show a significant negative association between insufficient remuneration and AOC, suggesting that compensation strategies might be a third area for consideration. Longitudinal studies could investigate whether and how comprehensive compensation packages including appropriate basic salary and supplements based on competencies, experience, and responsibilities [139, 140] affect AOC over time. Hospitals might also consider additional components such as housing, commuting cost, or exercise benefits [140]. Other potential elements may include individual performance- and innovation-based pay, project-based incentives, and performance-based remuneration linked to exceptional patient care outcomes or satisfaction levels at the unit and organizational levels [139, 141]. Research also indicates that different generations might have varying compensation

preferences [142]. Hospitals might benefit from collaboration between Management, HR and nursing professionals in developing compensation models that address nursing-specific needs [141]. However, potential unintended consequences warrant consideration– research suggests that pay practices with higher within-unit variation might be associated with reduced information sharing and safety organizing [143].

While these considerations are derived from observed associations in our cross-sectional study, future longitudinal and experimental research is warranted to examine whether implementing such changes actually leads to improved AOC outcomes. Such research could systematically investigate the effectiveness of specific interventions in leadership development, workload management, and remuneration strategies.

Acknowledgements
The authors thank all the participants who took part in this study.

Author contributions
Study conception and design: LF and CK; data collection: LF; data analysis and interpretation: LF and CK; drafting of the article: LF and CK; critical revision of the article: LF and CK; all authors read and approved the final manuscript.

Funding
This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors. Upon acceptance of the manuscript, the article processing charge was generously covered by Helios Kliniken GmbH, Berlin, Germany, under the Helios Research Funding scheme.

Data availability
The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate
Ethical review and approval were waived for this study by the Interdisciplinary Research Ethics Committee of the Catholic University of Applied Sciences Munich because the ethics review committee's statutes indicated that the study did not require an ethics review. Participation in the study was voluntary and anonymous, the study did not contain any experimental manipulations or involve vulnerable groups, there were no risks in answering the questions, and there were no incentives to participate. The data were collected in accordance with the European Union's General Data Protection Regulation. Informed consent was obtained from all subjects involved in the study.

Consent for publication
Not applicable.

Competing interests
The authors declare no competing interests.

Received: 16 July 2024 / Accepted: 24 March 2025
Published online: 22 April 2025

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