



## Research article

# The relationships among career adaptability, career commitment, career identity, and career well-being in Chinese nursing undergraduates: A longitudinal study

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## ARTICLE INFO

## Keywords:

Career adaptability  
Career commitment  
Career identity  
Career well-being  
Career interests  
Mediation effect  
Undergraduate nursing students

## ABSTRACT

Exploring the longitudinal relationship between career adaptability, career commitment, career identity, and career well-being among Chinese undergraduate nursing students. A mediation effect analysis was performed. The Career Adaptability Scale, the Chinese version of Career commitment, the Career identity Scale, and the Career well-being Scale were used as research instruments. Six hundred ninety-two nursing students were followed up in two waves to explore the relationships among career adaptability, career commitment, career identity, and career well-being. Model comparison was performed to explore the differences in such relationships between low and high-career interests. Career commitment at T1 mediated the relationship between career adaptability at T1 and career identity at T2 and that between career adaptability at T1 and career well-being at T2. Significant differences were observed between the mediation models of nursing students with high and low career interests. Career commitment plays a longitudinal mediator role in the relationship between career adaptability and career identity and the relationship between career adaptability and career well-being.

## 1. Introduction

Economic, societal, and technological advancements have necessitated the need to adjust, adapt, and display flexibility, a requirement that the recent pandemic further emphasized [1]. The notions of protean and boundaryless careers have gained traction, underscoring the individual's responsibility in proactively managing one's career and positing that adaptability is a pivotal element in attaining success [2]. In this context, career adaptability has attracted significant attention as an essential mechanism for promoting effective career progression. Addressing specific professional and workplace challenges can improve well-being [3]. Career

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<https://doi.org/10.1016/j.heliyon.2024.e35152>

Received 25 January 2024; Received in revised form 14 July 2024; Accepted 23 July 2024

Available online 24 July 2024

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adaptability involves a set of behaviors, competencies, and attitudes that align individuals with particular occupations [4]. A synthesis of 90 studies [5], reveals adaptive responses (e.g., affective organizational commitment, career exploration, career decision-making self-efficacy; [6]), adaptive outcomes (e.g., career identity, calling, satisfaction, stress, employability, promotability, intention to leave, well-being; [3,7,8]), and specific demographic characteristics (e.g., age, education, career choice; [9]). Research in engineering and other disciplines has shown that career adaptability is crucial for students' career development [1,10,11]. These studies highlight the mediating role of learning engagement and career decision self-efficacy between career adaptability and career outcomes, suggesting potential issues of generalisability and specificity across disciplines. Nonetheless, research examining these relationships among nursing students is sparse. However, recent years have seen increasing tension between healthcare practitioners and patients, elevated workload demands, and higher safety risks due to the epidemic, leading to nursing students experiencing uncertain career goals, weakened professional convictions, reduced motivation for learning, and significant talent attrition [12]. Clinical internships are crucial in transitioning nursing students into practicing nurses, significantly impacting their development of professional attitude, emotional well-being, and identity [13]. Consequently, investigating the career adaptability, commitment, identity, and well-being is of paramount importance.

### 1.1. Career adaptability and career identity

Career adaptability is intrinsically linked with identity building. Career identity refers to an individual's self-awareness or comprehension of the underlying motivations for selecting specific careers, and it is intertwined with one's aspirations, values, and sense of purpose [14]. According to the Career Construction Theory [15], career adaptability serves as a resource for adaptability, potentially influencing adaptation responses and outcomes, notably enhancing career identity [7]. Empirical studies suggest that career adaptability enhances career identity levels. For example, Tien and Wang [16] discovered that career adaptability can augment career identity, and longitudinal analysis has shown that career adaptability, as measured six months prior, significantly and positively predicts subsequent career identity [7]. This implies that greater adaptability early in career development correlates with a stronger, more coherent career identity over time. Additionally, research on interventions like decision-making skills training and exposure to career opportunities shows that these can significantly clarify and strengthen career identity [17]. These findings underscore that improving adaptability directly fosters a more defined and robust career identity.

### 1.2. Career adaptability and career well-being

Career adaptability can be conceptualized as an intersection of personal resources instrumental in shaping a career and sustaining well-being [8]. A nurse's career well-being encompasses the profession's rewards and benefits, recognizing that nursing practice promotes personal growth [18]. Career well-being has been identified as an adaptation outcome [8]. Numerous studies have explored the relationship between career adaptability and career well-being. For instance, Konstam et al. [17] examined the impact of career adaptability on the career well-being of 184 unemployed emerging adults aged 21 to 29. Johnston et al. [19] investigated occupational trajectory groups, personality characteristics, and career adaptability as predictors of one-year career well-being. These studies emphasize adaptability's proactive role in directing career trajectories toward more fulfilling outcomes. Research also investigates how career adaptability influences well-being across various demographic groups, including age cohorts, cultural backgrounds, and educational levels. Findings show that adaptability universally enhances career well-being, though its most effective aspects may vary by demographic characteristics [8,20].

### 1.3. Career commitment as a mediator

The underlying mechanisms connecting career adaptability and career identity/career well-being are still not well understood. Career commitment serves as a critical mediator in this relationship [21], bridging individual capabilities and career achievements. According to Career Construction Theory [15], career development involves stages such as adaptive readiness, mobilization of resources, adapting responses, and resulting in adaptation outcomes. These stages highlight the dynamic nature of career development, influenced by an individual's readiness to adapt to change. Recent empirical studies support career commitment's mediating role in linking career adaptability to both identity and well-being outcomes. For instance, Woo [22] found that higher levels of career adaptability directly enhance career commitment, thereby strengthening career identity. Similarly, Wilson et al. [23] and Chen & Zhang [24] showed that career commitment strengthens career identity and significantly boosts workplace well-being in various settings, including healthcare. This evidence indicates that career commitment is a pivotal link translating adaptability into professional growth and satisfaction. Additionally, while the longitudinal study of career development offers valuable insights, it is still underexplored.

### 1.4. Differences in career interests

Career interests serve as enduring psychological dispositions that significantly guide individuals' behavior and shape their preferences for specific work activities and environments [25,26]. According to Van Iddekinge et al. [27], these interests are pivotal predictors of life outcomes, educational decisions, and career choices. Wilson et al. [23] emphasized that selecting a profession represents the foremost decision, setting the stage for subsequent choices. In the past decade, the nursing field has seen a significant influx of students. Unfortunately, many of these students have chosen nursing due to perceived job prospects or familial influence rather than

innate talents or interests [28]. Salamonson et al. [9] suggested that in such contexts, career choice could indicate the successful attainment of a nursing degree.

The relationship between career interests and career outcomes such as adaptability, commitment, identity, and well-being is complex and varies significantly across different professional fields. Significant differences in career commitment exist between individuals with high and low-career interest [29]. Sverko & Babarovic [26] emphasize that career interests can profoundly influence one's career adaptability, which then affects their overall career satisfaction and success. Similarly, Mrayyan & Al-Faouri [30] and Guo & Qin [31] found that greater alignment between personal interests and professional roles enhances both career commitment and identity. Research consistently shows that discrepancies in career interests can lead to different career outcomes. Ji [32] found that students with limited interest in traditional Chinese medicine showed lower levels of professional emotion, value, and commitment, negatively affecting their career identity. Zhang et al. [12] found significant differences between high and low career interest groups in how career adaptability predicts career commitment. These findings highlight the importance of aligning personal interests with professional choices to improve career satisfaction and identity. In response to these disparities, our study aims to conduct a comparative analysis of the relationships among career adaptability, commitment, identity, and well-being in nursing, particularly focusing on how career interests mediate these relationships.

### 1.5. Theoretical framework

Career Construct Theory offers a comprehensive theoretical framework aimed at elucidating the career development process, centered around the concept of "adaptation". Career Construct Theory, as proposed by Savickas [15], posits a robust connection between adaptive responses (e.g., affective organizational commitment, career exploration, career decision-making self-efficacy; [6]), adaptive outcomes (e.g., career identity, sense of purpose, career well-being; [3,7,8]), and career adaptability. The Career Construct Theory postulates that individuals possess psychosocial resources enabling them to self-adjust and undertake practical measures to navigate evolving career contexts, ultimately leading to relatively stable, balanced, and well-adjusted outcomes [15]. Empirical studies have demonstrated that career commitment arises from career adaptability and subsequently fosters the development of career identity or career well-being ([23,24]; [22]). Drawing from Career Construct Theory and extant literature, it is plausible that career commitment could function as a mediating factor in the link between career adaptability and either career identity or career well-being.

According to London' [33] s model of career motivation, one of the individual traits, namely interest, exerts a direct influence on the immediate environment. The greater the stability of an individual's career interest and its integration into their self-concept, the more pronounced the direct impact of career interest on their career choices and behaviors [12]. In other words, increased career interest corresponds to a more substantial influence of career adaptability on various other career-related factors.

### 1.6. The present study

The relationships among career adaptability, career commitment, and career identity/career well-being may be intricate and have not received extensive investigation. The current two-wave longitudinal study sought to clarify these connections among Chinese nursing undergraduates. The study aimed to test the following hypotheses.

- H1.** The relationship between career adaptability at T1 and career identity at T2 is mediated by career commitment at T1.
- H2.** The relationship between career adaptability at T1 and career well-being at T2 is mediated by career commitment at T1.
- H3.** There are significant career interest differences in the mediation model.

## 2. Method

### 2.1. Participants and data collection

This study was a longitudinal design to explore the relationship of career adaptability, career commitment, career identity and career well-being. Data were collected from Chinese college students, utilizing Wenjuanxing (<https://www.wjx.cn/>), a popular survey website in China that enables contactless data collection. Through convenience sampling, 823 undergraduate students aged 19–24 were recruited. The study analyzed data collected at two intervals during 2021–2022, with one year gap, involving a total of 692 undergraduate students (89.3 % female; age in 2021:  $M = 21.06$  years,  $SD = 0.81$ ). At the initial data collection in June 2021 (referred to as T1), excluded questionnaires that exhibited obvious response patterns or had more than 15 % unanswered questions were excluded, resulting in 823 valid questionnaires. Followed by a second assessment in June 2022 (T2,  $N = 795$ ). A total of 692 students participated in both waves of the survey. Participants were informed of the voluntary nature of the study and were assured that declining to participate would not have any negative consequences. The research coordinators upheld data confidentiality and emphasized that only researchers would access the data. Students' identities and ID numbers were inaccessible to researchers to ensure anonymity. The questionnaires were completed within educational settings, and no monetary compensation was provided to participants.

## 2.2. Measurements

### 2.2.1. Demographic measurements

A background questionnaire was administered to gather demographic data, including gender, age, place of origin, presence of other siblings, and parents' educational level. Career interests were assessed using the participant's attitudes toward the nursing profession.

### 2.2.2. Career adaptability

The 21-item Career Adaptability Scale [34] was used to assess college students' career adaptability. An example item is "I can make the right decision when faced with different job options." Respondents rated their agreement with each item on a 5-point Likert scale, ranging from 1 ("strongly disagree") to 5 ("strongly agree"). A higher score indicated a higher level of career adaptability, while a lower score indicated a lower level of career adaptation. This scale has previously shown good validity and reliability among Chinese undergraduates [12]. The scale's Cronbach's alpha was 0.95 at T1.

### 2.2.3. Career commitment

To measure the career commitment of college students across four dimensions, the Undergraduate Career Commitment Scale was used [35]. Its 27 questions are answered using the five-point Likert scale (1 = totally disagree, 5 = absolutely agree). Overall score: 27–135, with higher scores, indicating a more significant commitment. The measure has adapted well to the Chinese cultural context [12]. The scale's Cronbach's alpha was 0.96 at T1.

### 2.2.4. Career identity

The 21-item Career Identity Scale was used to assess the career identity of college students: (a) sense of self-efficacy and mastery, (b) sense of congruence, (c) sense of self-determination, (d) sense of patient and organizational impact, and (e) sense of meaningfulness [36]. Its 21 questions are answered using the seven-point Likert scale (1 = totally disagree, 7 = absolutely agree). Overall score: 21–147, with higher scores, indicating a greater career identity. The measure has adapted well to the Chinese cultural context [31]. The scale's Cronbach's alpha was 0.99 at T2.

### 2.2.5. Career well-being

The 21-item Career Well-being Scale was used to assess the five-dimensional career well-being of college students: (a) positive career perception, (b) good nurse-patient relationship, (c) family and friend identification, (d) sense of belonging to a team, and (e) own growth [18]. Its 21 questions are answered using the five-point Likert scale (1 = totally disagree, 5 = absolutely agree). Overall score: 21–105, with higher scores indicating greater career well-being. The measure has adapted well to the Chinese cultural context [37]. The scale's Cronbach's alpha was 0.99 at T2.

## 2.3. Data analysis

SPSS 27.0 and Mplus 8.3 were used for this analysis. The missing data were handled using a model-based approach, Maximum Likelihood Estimation (MLE). This approach added the missing data directly to the model as part of the analysis. Missing data were marked in Mplus by the statement "MISSING = ALL (999)". The robust weighted least squares estimator (WLSMV) was employed to estimate the models [38]. The fit of all models was evaluated using various indices operationalized in Mplus [39]: the WLSMV chi-square statistic ( $\chi^2$ ), comparative fit index (CFI), Tucker–Lewis index (TLI), root mean square error of approximation (RMSEA), Standardized Root Mean Square Residual (SRMR), and its 90 % confidence interval. The fit coefficients are understood similarly to ML estimates with acceptable model fit (CFI, TLI  $\geq 0.90$ ; RMSEA, SRMR  $\leq 0.80$ ),  $\chi^2/df$  less than 3 is considered ideal, while 3–5 is acceptable [40]. This study employed the Monte Carlo method for sample size calculation [41], using a sample size 10 times the number of scale dimensions (totaling 180), deemed sufficient for the analysis.

## 3. Results

### 3.1. Preliminary analyses

Of these 692 participants, 89.3 % were female, 26.2 % were from urban areas, and 32.8 % lived in a one-child family. The participants had a mean age of 21.06 years (SD = 0.81, range = 19–24 years). Regarding career interests, segmentation by mean, 307 and 385 participants had high and low career interests, respectively. Regarding parental education, 70.1 % of the fathers and 77.8 % of the mothers had completed junior middle school or lower level. 29.9 % of the fathers and 22.2 % of the mothers had completed senior middle school level or above. We compared the characteristics of those who were followed up ( $n = 692$ ) versus those who were missing in the first and second follow-up surveys ( $n = 103$ ). The two groups did not differ in socio-demographic characteristics or the levels of the independent and dependent variables ( $p > 0.05$ ). Table 1 displays the significant and positive correlations among all variables.

### 3.2. The mediation model

Latent variable structural equation models were constructed to analyze the mediating effects between career adaptability at T1, career commitment at T1, career identity at T2, and career well-being at T2 among nursing students in the general model. Model

**Table 1**

Mean scores, standard deviations, and correlations for CA1, CC1, CI2, and CW-B2.

Variables		M	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
CA1	1.CA11	17.82	2.84	1																
	2.CA12	18.26	2.81	0.89***	1															
	3.CA13	17.58	2.6	0.88***	0.88***	1														
	4.CA14	17.86	2.64	0.87***	0.89***	0.87***	1													
CC1	5.CC11	24.9	3.85	0.69***	0.70***	0.70***	0.72***	1												
	6.CC12	21.36	3.06	0.63***	0.66***	0.66***	0.70***	0.88***	1											
	7.CC13	24.48	3.44	0.64***	0.65***	0.65***	0.69***	0.89***	0.87***	1										
	8.CC14	20.81	3.54	0.65***	0.62***	0.64***	0.64***	0.88***	0.82***	0.86***	1									
CI2	9.CI21	25.81	4.94	0.34***	0.34***	0.34***	0.33***	0.32***	0.28***	0.34***	0.32***	1								
	10.CI22	21.02	3.98	0.35***	0.36***	0.36***	0.35***	0.33***	0.30***	0.34***	0.33***	0.95***	1							
	11.CI23	20.77	3.98	0.34***	0.36***	0.36***	0.34***	0.31***	0.29***	0.33***	0.31***	0.95***	0.94***	1						
	12.CI24	20.83	4.05	0.34***	0.35***	0.34***	0.35***	0.35***	0.32***	0.36***	0.35***	0.91***	0.92***	0.91***	1					
	13.CI25	21.05	3.98	0.34***	0.37***	0.35***	0.36***	0.36***	0.34***	0.36***	0.33***	0.92***	0.93***	0.93***	0.96***	1				
CW-B2	14.CW-B21	19.77	3.13	0.33***	0.37***	0.34***	0.34***	0.36***	0.35***	0.37***	0.35***	0.80***	0.82***	0.80***	0.86***	0.86***	1			
	15.CW-B22	23.45	3.85	0.34***	0.37***	0.35***	0.35***	0.37***	0.34***	0.37***	0.36***	0.82***	0.83***	0.82***	0.88***	0.86***	0.95***	1		
	16.CW-B23	23.61	3.77	0.33***	0.36***	0.34***	0.34***	0.36***	0.34***	0.36***	0.35***	0.80***	0.82***	0.80***	0.87***	0.85***	0.96***	0.96***	1	
	17.CW-B24	23.73	3.71	0.33***	0.36***	0.34***	0.34***	0.35***	0.34***	0.36***	0.34***	0.80***	0.82***	0.81***	0.86***	0.85***	0.96***	0.96***	0.96***	1
	18.CW-B25	23.5	3.8	0.33***	0.35***	0.34***	0.34***	0.37***	0.34***	0.37***	0.36***	0.81***	0.82***	0.81***	0.87***	0.85***	0.95***	0.97***	0.96***	0.96***

\*,  $p < 0.05$ ; \*\*,  $p < 0.01$ , \*\*\* $p < 0.001$ . CA11 = Career confidence at T1, CA12 = career curiosity at T1, CA13 = career focus at T1, CA14 = career control at T1, CA1 = career adaptability at T1; CC11 = Emotional commitment at T1, CC12 = continuing commitment at T1, CC13 = aspirational commitment at T1, CC14 = normative commitment at T1, CC1 = career commitment at T1; CI21 = sense of self-efficacy and mastery at T2, CI22 = sense of congruence at T2, CI23 = sense of self-determination at T2, CI24 = sense of patient and organisational impact at T2, CI25 = sense of meaningfulness at T2; CI2 = career identity at T2; CW-B21 = positive career perception at T2, CW-B22 = good nurse-patient relationship at T2, CW-B23 = family and friend identification at T2, CW-B24 = sense of belonging to a team at T2, CW-B25 = own growth at T2; CW-B2 = career well being at T2.

estimation results are presented in Fig. 1. The mediating effect model fit the data well ( $\chi^2 = 581.297$ ,  $df = 119$ ,  $p < 0.001$ ; CFI = 0.976, TLI = 0.969, RMSEA = 0.075 [0.069, 0.081], SRMR = 0.041). The results indicated that career adaptability at T1 significantly predicted career commitment at T1 ( $\beta = 0.76$ ,  $p < 0.001$ ), career identity at T2 ( $\beta = 0.68$ ,  $p < 0.001$ ), and career well-being at T2 ( $\beta = 0.28$ ,  $p < 0.001$ ). Career commitment at T1 significantly predicted career identity at T2 ( $\beta = 0.18$ ,  $p < 0.001$ ) and career well-being at T2 ( $\beta = 0.36$ ,  $p < 0.001$ ). The indirect effects via career commitment were significant, with 95 % bias-corrected confidence intervals based on 5000 bootstrapped samples. Specifically, career commitment at T1 partially mediated the relationship between career adaptability at T1 and career identity at T2 (indirect effect = 0.14, SE = 0.05, accounting for 7.97 % of the total effect) and between career adaptability at T1 and career well-being at T2 (indirect effect = 0.47, SE = 0.08, accounting for 26.34 % of the total effect). Therefore, Hypotheses 1 and 2 were supported.

### 3.3. A comparison of differences in low-career interests and high-career interests

Multi-group comparative structural equation modeling was conducted to examine potential differences in the mediating model among nursing students with low and high career interests (see Table 2). The results indicated a significant difference between the chi-square test results of the control model and the free estimation model ( $\Delta\chi^2(7) = 106.806$ ,  $p < 0.001$ ). This multi-group comparison revealed that the high-career interest group significantly differed from the low-career interest group in terms of the pathway of career commitment at T1 predicting career identity at T2: Wald Test of Parameter Constraints ( $t = 6.99$ ,  $p < 0.01$ ). Specifically, career commitment at T1 significantly and positively predicted career identity at T2 in the high-career interest group ( $b = 0.28$ ,  $p < 0.001$ ), while career commitment at T1 did not significantly predict career identity at T2 in the low-career interest group ( $b = 0.05$ ,  $p > 0.05$ ). No significant group differences were observed in the other pathway comparisons. The path coefficients of the free estimation model for the high-career interest and low-career interest groups are presented in Figs. 2 and 3, respectively.

## 4. Discussion

This study used a longitudinal mediation model to examine the relationship between career adaptability at T1, career commitment at T1, career identity at T2, and career well-being at T2. It further compared the role of career interests in the mediation models. The results show that career commitment at T1 mediates the relationship between career adaptability at T1 and career identity at T2 and career adaptability at T1 and career well-being at T2, respectively, and that this relationship differs in terms of low and high-career interest groups.

### 4.1. The mediating role of career commitment in the relationship between career adaptability and career identity

The results indicated a significant positive link between career adaptability at T1 and career identity at T2, with career commitment at T1 having an indirect effect, thereby confirming Hypothesis 1. Our findings align with previous research and are supported by Career Construction Theory [15], which suggests commitment is crucial in managing and deriving satisfaction from career development processes. Initially, career commitment at T1, influenced by career adaptability, enables nursing students to enhance their professional knowledge and job confidence [6]. Setting clear expectations and goals typically increases students' career commitment [18]. Additionally, students with higher career commitment develop a deeper understanding and recognition of the nursing profession after internships. This aligns with research identifying career commitment as an indicator of intent to persist in the profession, observed in both the teaching and medical fields [23,42]. Students with high career commitment often have a deeper perception of the

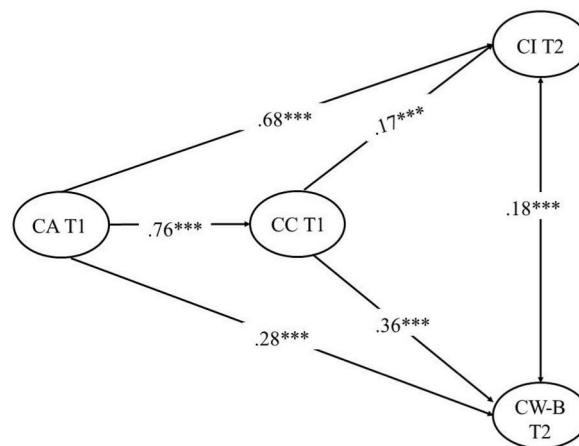
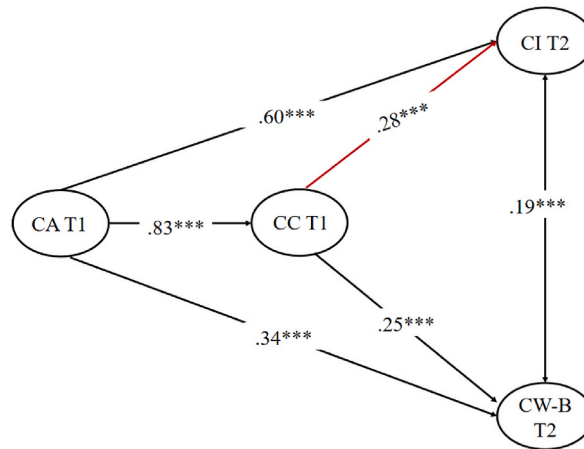


Fig. 1. The structural model.

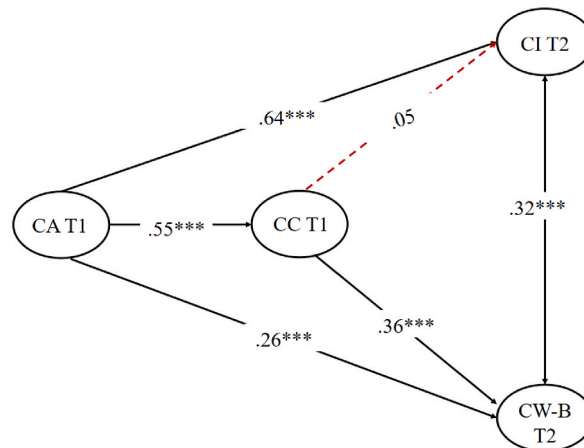
Note: \*\*\*,  $p < 0.001$ . CA T1 = career adaptability at T1, CC T1 = career commitment at T1, CI T2 = career identity at T2, CW-B at T2 = career well-being at T2.

**Table 2**  
Model comparison between the high and low-career interests groups.

	Model fit						
	$\chi^2$	df	p	CFI	TLI	RMSEA	SRMR
Limited	785.503	269	<0.001	0.973	0.969	0.074	0.095
Free estimation model	678.697	262	<0.001	0.978	0.975	0.068	0.080



**Fig. 2.** High-career interests groups.  
Note. Dashed lined indicated that path coefficients are not significant. Significantly different path is marked in red. (For interpretation of the references to colour in this figure legend, the reader is referred to the Web version of this article.)



**Fig. 3.** Low-career interests groups.

medical profession and a stronger sense of professional belonging, aspiring to become skilled doctors [31]. Furthermore, workers with a strong career identity are more likely to dedicate themselves to their careers, enhancing their success [23].

Higher levels of career adaptability correlate with the development of career identity, as strong alignment with a meaningful career reflects an individual’s self-concept in professional activities [43]. Specifically, adaptability skills translate into long-term benefits in career identity and well-being. For example, by enhancing adaptability, nursing students can set clearer career goals, thereby increasing their commitment and subsequently their identification with the nursing profession [44]. The critical role of career commitment in enhancing career identity and well-being highlights the need for targeted interventions by nursing educators and managers. Programs fostering career adaptability and commitment should include mentorship, career planning workshops, and professional development opportunities tailored to individual aspirations. These initiatives could develop a more resilient nursing workforce equipped to meet the profession’s demands and challenges.



#### 4.2. The mediating role of career commitment in the relationship between career adaptability and career well-being

The present study found that career adaptability at T1 significantly predicted career well-being at T2, with career commitment at T1 mediating this relationship, thus confirming Hypothesis 2., This aligns with previous research indicating that career adaptability helps individuals manage stress and setbacks and enhances career well-being by boosting commitment to their careers [17,19]. These results support the Career Construction Theory [15], which views adaptability as a proactive driver for career success, enhancing individual commitment by providing necessary psychological resources for adaptation and growth. This enhanced commitment also boosts individuals' career identity and satisfaction, ultimately improving career well-being significantly.

Consistent with prior studies, career commitment was shown to predict career well-being [24]. Nurses with high career commitment levels identify strongly with their profession, invest substantial effort, and consequently enjoy enhanced professional knowledge, skill development, career advancement, and overall career well-being [37]. This suggests nursing managers should adopt strategies to enhance nurses' career well-being, including promoting professional growth, providing study abroad opportunities, financial support, and platforms to showcase talents [37].

Employees with high levels of career adaptability often outperform peers, earning greater rewards and recognition, which fosters positive emotional experiences [45]. High career adaptability is linker to improved job performance and more prosperous career trajectories [5]. In nursing, a strong sense of career well-being has shown positive impacts [46]. Given the nursing profession's stressful and dynamic nature, our findings suggest that interventions to increase career adaptability could be highly beneficial. Training programs that develop flexible career attitudes and skills can enhance nurses' well-being, with practical applications including workshops on stress management, career planning, and problem-solving.

#### 4.3. Differences in career interests

A multi-group comparison method was employed to further assess the mediating relationship between career adaptability, career commitment, and career identity/career well-being among nursing students with varying levels of career interest. The results supported Hypothesis 3 (H3), revealing a statistically significant difference in the mediation between career adaptability, career commitment, and career identity/career well-being for both low and high-career interest groups. Specifically, career commitment at T1 predicted career identity at T2 for the high-career interest group, while no significant prediction was found for the low-career interest group. This indicates that nursing students with high career interests are more inclined to adopt positive evaluations, leading to favorable career attitudes and behaviors [47], the formation of accurate career values, and the enhancement of career identity [48]. Conversely, those with low career interests often lack direction, exhibit reduced self-control, and find less fulfillment in their profession [49]. For example, career commitment at T1 does not predict career identity at T2 when specific circumstances arise during an internship [31]. Therefore, efforts to increase professional interests may enhance students' professional performance. To foster the professional identity of nursing students, mentors should encourage a positive perception of the field [47].

This findings emphasize the need to strengthen career adaptability and commitment in nursing education, especially among trainees. Comparing these findings with those from other disciplines allows a deeper exploration of the universality and variability of career resilience training and commitment across fields [10,11]. For example, engineering students may require resilience training to adapt to rapid technological changes, whereas business students might focus more on building career networks. This comparative approach not only deepens our understanding of career resilience development but also supports higher education institutions in creating more comprehensive and targeted career support strategies.

Enhancing career adaptability and commitment in nursing students may improve their career identity and well-being. For example, the professional curriculum incorporates vocational education, with lectures often focusing on improving career adaptability [50]. Practically, nursing students should receive training in career adaptability, including career group counseling and emotional control [46]. Integrating career development elements into the nursing curriculum, such as case studies and role-playing, can enhance adaptability skills, improve clinical problem-solving, and foster career commitment and identity development [51]. Mentorship programs, where experienced nurses guide students in career planning and role understanding, significantly enhance career trajectories and satisfaction [52]. Additionally, workshops on career management and stress resilience are crucial for empowering students to proactively manage their careers and the demands of nursing. These workshops should focus on effective stress management and emotional resilience strategies, essential for high job performance and well-being. Implementing real-time feedback and support systems during internships bridges the gap between theory and practice, enhancing learning and adaptability in real-world settings [53]. Collectively, these initiatives aim to enhance both the educational and professional development of nursing students and healthcare outcomes by preparing a resilient, committed workforce skilled in navigating modern healthcare complexities.

## 5. Limitations

Some restrictions must be recognized. First, the extrapolation of our results should be regarded seriously because we carefully chose a representative sample of university students to prevent sampling bias. This idea might be expanded in the future to different populations. Moreover, the study used a self-report survey. To better understand people's psychological and behavioral states, the future study may gather data from various information sources (such as peers and parents) and research techniques (such as qualitative interviews). Second, this study avoided some drawbacks of cross-sectional investigations by using a longitudinal research design. Future studies could use cross-lagged models to investigate the link between the variables.



## 6. Conclusions

The findings of the study led to the following interpretations. In the mediated link between career adaptability at T1, career commitment at T1, and career identity at T2/career well-being at T2, significant career interest differences they existed in the mediated relationship between career adaptability at T1, career commitment at T1, and career identity at T2/career well-being at T2.

### Ethics approval and consent to participate

This study followed the Declaration of Helsinki, and all participants provided informed consent. The corresponding author's university academic committee granted ethical approval for the study with approval number: [2022–028].

### Date

The datasets in the study are available from the corresponding author upon reasonable request.

### CRedit authorship contribution statement

**Chengjia Zhao:** Writing – review & editing, Writing – original draft, Methodology, Investigation, Formal analysis, Data curation. **Guoliang Yu:** Methodology, Conceptualization. **Yan Cai:** Writing – original draft, Data curation. **Peisen Zheng:** Writing – original draft, Data curation. **Huihui Xu:** Writing – original draft. **Feiyue Li:** Formal analysis. **Guohua Zhang:** Methodology, Conceptualization. **Jingjing Zhang:** Funding acquisition.

### Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

### Acknowledgments

All authors have made substantial contributions to the research design, data collection, analysis, and interpretation; participated in drafting and critically revising articles; agreed to submit to the current journal; approved the version to be published; and agreed to be responsible for all aspects of the research.

#### Funding

This work was supported by the Wenzhou City Scientific Research Project: [Y2023060].

### Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.heliyon.2024.e35152>.

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