Artificial Intelligence Technology and Its Relation to Job Control and Job Crafting among Intensive Care Nurses

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Abstract
Background: Artificial intelligence technology (AIT) makes a profound change in critical care settings involving nursing profession. It can help intensive care nurses (ICNs) to make more precise decisions and become higher job controlled. On the other side, this digital transition requires nurses to craft their work by altering their thinking regarding their jobs to be more satisfying and meaningful for them. **Aim:** To explore artificial intelligence technology perception and its relation to job control and job crafting among intensive care nurses. **Design:** Descriptive correlational design was utilized. **Setting:** The study was carried out at Tanta University Hospitals including all ICUs. **Subjects:** A stratified random sample was taken from intensive care nurses (n = 268). **Tools:** Three tools were used namely; Artificial Intelligence Technology Perception Questionnaire, Job Control Scale, and Job Crafting Scale. **Results:** About half (50.4%) of ICNs had a high level of artificial intelligence technology perception. Around two thirds (64.6%) of ICNs had a high level of job control. More than two thirds (66.8%) of ICNs had a high level of job crafting. **Conclusion:** There was a statistical significant positive correlation between intensive care nurses' artificial intelligence technology perception, job control, and job crafting. **Recommendation**: Conducting periodic workshop and training programs about artificial intelligence and job crafting. Creating supportive working environment that enhances nurses' job control and job crafting.

Keywords: Artificial Intelligence Technology, Intensive Care Nurses, Job Control, Job Crafting & Perception

Introduction

Everything around the world is changing, and the nursing profession is no exception. Over the years, the primary focus of nursing has been providing care to patients; however, everything has changed from simple domestic work and caring to requiring actual clinical experience and medical technology knowledge **(Pepito & Locsin, 2018)**. Nursing practice has become more standardized than in the past, which requires nurses to make more important decisions. In addition to shifting from paper to mostly digital patient records, other tools such as wearable technology, mobile apps, smart beds, and mobile monitoring devices have been added to the nursing toolkit and have been identified as significant recent technological advancements in nursing practice. So, it is necessary to adapt the traditional role of nurses to take into account these technological advancements **(Boothet al., 2021)**.

Nowadays, the healthcare world endorses a fast technological evolution, including emerging artificial intelligence technology (AIT). The AIT becomes widely used in our modern lives, specifically in medical and nursing practice. It is likely to change the health world and the way it works. It offers chances and challenges for the nursing profession **(Van Bulck et al., 2023)**. So, nurses have to be immersed in conceptualizing, developing, and implementing AIT.

The AIT includes numerous healthcare technologies that can alter nurses' roles and improve patients' care, including robots, algorithms, risk prediction, speech recognition, and clinical decision support **(Robert, 2019; Pailaha, 2023)**.

Artificial intelligence technology appears as a promising tool, specifically in critical care sections involving intensive care units (ICUs). Intensive care units are considered pressured, highly complex, and unstable environments where doctors and intensive care nurses (ICNs) need to investigate a large amount of diverse data to make critical decisions. Effective AIT usage in critical care can reduce this problem by converting data into more actionable information for managing highly complex situations **(Lovejoy et al., 2019)**. Intensive care nurses are well-trained and specialized healthcare personnel working in a highly complex and technological world to deliver care for patients with serious illnesses, either intubated, ventilated, or taking lifesaving medications, which requires making quick decisions and acting quickly when patients' conditions change **(Yoo et al., 2020)**.

Artificial intelligence technology has the power to help ICNs provide highly efficient and productive nursing care, where it can do human-like tasks efficiently involving exploring, learning, consolidating, forecasting, and making decisions. It enhances the efficiency of clinical processes through

decreasing consultation time, increasing diagnosis, making risk predictions, and recommending more clinical and cost-effective procedures for treating patients (**Ng et al., 2022**). Additionally, AIT can help ICNs provide routine nursing care involving monitoring vital signs and accurate documentation (**Ortigosa et al., 2023**). Furthermore, AIT can help nurses in making clinical decisions, developing individualized nursing care plans; thus, it grants them more job control and more time for nurse-patient interactions (**Li et al., 2022**).

Job control can be defined as the extent to which nurses have autonomy in determining work methods. Nurses who can decide how they can work and schedule their work tasks perceive high job control (**Tremblay, 2021; Zhao &Yin, 2023**). Currently, the nursing discipline places a great emphasis on integrating healthcare professionals in both management and clinical practice with problem-solving and decision-making abilities. Then, more decision-making authority and responsibility are required for nurses, which are reflected in professional practice regulation (**Fernandes et al., 2023**).

Job control or decision latitude consists of binary dimensions, including skilled discretion and decision autonomy. Firstly, skilled discretion denotes the creativity and skills needed for accomplishing nurses' jobs. Secondly, decision autonomy entails providing decision-making chances for nurses regarding their labor (**Yamaguchi, et al., 2016**). Numerous skills are needed for nurses with high job control, including collaboration, communication, leadership, and resource management. Nurses with high levels of work autonomy sense more freedom and seem to be high-performing, fulfilled, and committed nurses (**Navajas-Romero et al., 2020**).

Enforcing nurses' job control requires them to cope with this digital transformation through developing their knowledge and equipping them with proficient skills to deliver superior nursing care based on recent scientific findings, namely job crafting (**Fernandes et al., 2023**). Job crafting is a modern, adaptable technique of working through initiative to adjust or redesign an individual's own job to make it more satisfying and meaningful by altering task activities and using judgment in choosing with whom to work for better patient care (**Harbridge et al., 2022**)

Job crafting implies nurses' self-improvement concerning their job duties (**Bacaksız et al., 2018**). Job crafting denotes four domains as follows: increasing structural job resources; increasing social job resources; increasing challenging job demands; and decreasing hindering job demands (**Moreira et al., 2022**). Job resources entail work structures that help in achieving job goals and inspire growth, while

job demands entail the necessity of physical and psychological effort as well as specific expenses (**Laurence et al., 2020**).

Job demands can be categorized into two classifications. Firstly, hindering job demands that illustrate excessive constraints inhibit nurses' ability to achieve job goals. Secondly, challenging job demands exemplify those that may provoke anxiety and stress, but they are gratifying and deserve the efforts. Nurses can employ job crafting when they can increase job resources, either structural or social, through education or consulting others. They can increase challenging job demands by holding additional duties and looking for difficult work (**Abou Shaheen & Mahmoud, 2021**).

Moreover, oppressive job demands can be decreased by ensuring that nurses' work is physically, mentally, and emotionally less intense to meet their needs and abilities (**Roczniewska & Wojciszke, 2021**). Nurses' job crafting is strongly associated with nurses' wellbeing, job satisfaction, motivation, commitment, and highly significant contributions to the achievement of organizational goals (**Ghazzawi et al., 2021**).

Significance of the study

Widening epidemics and critically ill patients are considerably affecting the health system and the worldwide economy as a whole. It provides the chance for the technology of artificial intelligence to invade the health field. The AIT has a great ability to promote critical care and improve patient outcomes by assisting critical care professionals in disease perception and timely clinical decisions. The AIT has the potential to transform critically ill patients care and nourish health system efficiency (**Li et al., 2022; Saqip et al., 2023**).

Qin et al., (2017); Martikainen et al., (2020) reported that to maximize the value of medical AIT, the ICNs are needed to adopt, improve, and extend it to enhance work efficiency. In these complex digital circumstances, ICNs may complain of heavy workloads and job strain that can negatively affect their performance and well-being. Thus, job crafting is crucial for ICNs to alter the perceived characteristics of their jobs to make their burdens and the resources available in harmony to cope with these stressors (**Shi et al., 2021; Topa & Aranda-Carmena, 2022**). Nurses' job crafting can stimulate job control where they become more dedicated to incorporating several tasks into their roles and utilize resources to adjust their job to make their work environment align with their needs and abilities to enhance the work process (**Chang et al., 2021**).

The study aim:
To explore artificial intelligence technology perception and its relation to job control and job crafting among intensive care nurses.

Research questions
- What are the levels of artificial intelligence technology perception among ICNs at Tanta University Hospitals?
- What are the levels of job control among ICNs at Tanta University Hospitals?
- What are the levels of job crafting among ICNs at Tanta University Hospitals?
- Are there correlations between ICNs' perception regarding artificial intelligence technology and job control and job crafting at Tanta University Hospitals?
- Is there a correlation between ICNs' job control and job crafting at Tanta University Hospitals?

Subjects and Method
Research design:
A descriptive correlational research design was utilized to conduct this study**.**

Setting
The existing study was carried out at Tanta University Hospitals that belong to the Ministry of Higher Education and Scientific Research, including all ICUs, namely, Neurology, Cardiology, Neonates, Pediatric, Medical, Anesthesia, Oncology, Emergency, and Chest ICUs

Subjects
A stratified random sample (n = 268) was taken from ICNs who were working in the previously mentioned settings. The sample size from the previously mentioned setting was proportional to the number in each working ICU; Neurology (n=94), cardiology (n= 43), Neonates (n= 26), Pediatric (n= 11) Medical (n=28), Anesthesia (n= 19), Oncology (n= 5), Emergency (n= 6), and Chest (n= 36). The size of the study sample was computed using Epi. Info. Microsoft to guarantee obtaining a representative and sufficient sample size, where N= Population size (875), confidence level at 95%, d= margin of error proportion (0.050) **(Dean & Sullivan, 2013)**.

 Inclusion Criteria: all available ICNs at the time of data collection were included in the study.
Exclusion Criteria: The subjects who filled out incomplete sheets and refused to participate in the study were excluded from the study subjects, while others participated.

Data Collection Tools
The present study used three tools, namely, the Artificial Intelligence Technology Perception Questionnaire, the Job Control Scale, and the Job Crafting Scale.

Tool I: Artificial Intelligence Technology Perception Questionnaire
It was developed by the researchers, guided by **Abd El-Monem et al., (2023**) **& Elsayed & Sleem, (2021)** and **Abdullah & Fakieh, (2020)** to assess levels of artificial intelligence technology perception among ICNs. It was comprised of two parts: **Part I:** ICNs' personal data, including gender, age, marital status, residency, educational qualification, name of working unit, and experience years. **Part II:** Artificial Intelligence Technology Perception Questionnaire. It comprised of 31 items and was classified into three dimensions: artificial intelligence general perceptions (6 items), artificial intelligence advantages in health care (19 items), and artificial intelligence application's problems in health care (6 items).

Scoring system
The responses of ICNs were measured on a five-point Likert scale: 5 = strongly agree, 4 = agree, 3 = neutral, 2 = disagree, and 1 = strongly disagree. Based on the cut-off points, it was obtained as high perception regarding artificial intelligence technology level ≥ 75%, moderate perception regarding artificial intelligence technology level 60%−<75%, and low perception regarding artificial intelligence technology level <60%.

Tool II: Job Control Scale
It was developed by the researchers, guided by **Sasaki et al., (2020) & Almendra, (2010)** to assess ICNs' job control levels. It comprised of 9 items and was categorized into two dimensions: skill discretion (6 items) and decision authority (3 items).

Scoring system
The responses of ICNs were measured on a four-point Likert scale: 4 = strongly agree, 3 = agree, 2 = disagree, and 1 = strongly disagree. Based on the cut-off points, it was obtained as high job control level ≥ 75%, moderate job control level 60 %−< 75%, and low job control level <60%.

Tool III: Job Crafting Scale
It was developed by the researchers, guided by **Bacaksiz et al., (2018)** to assess ICNs' job crafting levels. It comprised of 14 items and was classified into four dimensions: increasing structural job resources (3 items); increasing social job demands (4 items); increasing challenging job demands (3 items); and decreasing hindering job demands (4 items).

Scoring system
The responses of ICNs were measured on a five-point Likert scale: 5 = always, 4 = often, 3 = sometimes, 2 = rarely, and 1 = never. Based on the cut-off points, it was obtained as high job crafting level ≥ 75%, moderate job crafting level 60%−<75%, and low job crafting level <60%.

Method

Tools Validity and Reliability: Five experts in nursing administration were invited to evaluate its clarity, appropriateness, face, and content validity, and modifications were made. The Content Validity Index were 97 %, 93%, and 95% for tools I, II and III, respectively. Also, testing tools reliability through Cronbachs' Alpha Coefficient Factor to evaluate internal consistency that revealed (0.926) for Artificial Intelligence Technology Perception Questionnaire, (0.726) for the Job Control Scale, and (0.766) for the Job Crafting Scale indicating satisfactory internal consistency.

Pilot Study:

Conducted prior to data collection on 27 ICNs that represent 10% of the sample size to assess the applicability and clarity of the study tools, detect any problems, and approximate the mandatory time to fulfill the questionnaire that was taken for 10–15 minutes by each nurse. Pilot study sample sizes weren't excluded from the subjects due to the fact that no major adjustments were made.

Ethical Considerations:

An approval of the Scientific Research Ethical Committee at the Faculty of Nursing, Tanta University, was taken with Code Number 271-6-2023. Written and verbal consent were acquired from each participant prior to data gathering. The study's aim was explained to the study subjects, and participants' information was kept private. They were also given the assurance that they could leave at any time without providing any justification.

Data Collection Method:

An official permission was gained from both Tanta University Hospitals' Chief Executive Officers and supervisors of the previous mentioned settings before collecting data. All of the study tools have been presented in Arabic to be legible for all educational backgrounds.

Data Collection Phase:

Data were gathered from intensive care nurses by giving them a questionnaire sheet to fill in. They were told by the researchers that all data would only be used for purposes of the research and that an aggregate report of the findings would be published. About 10–15 minutes were taken to finish the questionnaire sheet. The two-month data collection period began on August 2023 to the end of September 2023.

Statistical Analysis:

Data analysis was done using version 20.0 (Armonk, NY: IBM Corp) of IBM SPSS software package. To illustrate the qualitative data numbers and percentages were utilized. To confirm the distribution's normality the Kolmogorov-Smirnov test was applied. The quantitative data were described as following metrics: mean standard deviation, median, and range (minimum and maximum). Significant results were judged at 5%. The used tests; **Student t-test**, **F-test (ANOVA)**, **Pearson coefficient**, and **Cronbach's Alpha test.**

Results

Table (1): Distribution of intensive care nurses according to their personal data (n=268)

Personal data	No.	%
Age (years)		
<25	71	26.5
25-<35	120	44.8
35<45	21	7.8
≥45	56	20.9
Min. – Max.	20.0 – 54.0	
Mean ± SD.	31.54 ± 9.74	
Gender		
Male	34	12.7
Female	234	87.3
Marital status		
Married	185	69.0
Unmarried	83	31.0
Residency		
Rural	178	66.4
Urban	90	33.6
Educational level		
Diploma in Nursing	59	22.0
Associate Degree in Nursing	106	39.6
Bachelor Degree in Nursing Science	100	37.3
Post-graduate	3	1.1
Working unit		
Neuropsychiatric ICU	94	35.1
Cardiac ICU	43	16.0
Neonatal ICU	26	9.7
Pediatric ICU	11	4.1
Medical ICU	28	10.4
Anesthesia ICU	19	7.1
Oncology ICU	5	1.9
Emergency ICU	6	2.2
Chest ICU	36	13.4
Years of experience		
<10	169	63.1
10 - <20	32	11.9
20 - <30	46	17.2
≥30	21	7.8
Mean ± SD.	10.61 ± 10.61	

Table (2): Distribution of levels and mean scores regarding intensive care nurses' perception of artificial intelligence technology (n = 268)

Dimensions of artificial intelligence technology perception	Low		Moderate		High		Total score
	No.	%	No.	%	No.	%	Mean ± SD.
Artificial intelligence general perceptions	76	28.4	81	30.2	111	41.4	22.22 ± 4.37
Artificial intelligence advantages in health care	54	20.1	52	19.4	162	60.4	76.69 ± 13.86
Artificial intelligence application's problems	57	21.3	55	20.5	156	58.2	23.38 ± 4.35
Total of artificial intelligence technology perception	**54**	**20.1**	**79**	**29.5**	**135**	**50.4**	**122.3 ± 20.61**

Table (3): Distribution of levels and mean scores of intensive care nurses' job control (n = 268)

Dimensions of job control	Low		Moderate		High		Total score
	No.	%	No.	%	No.	%	Mean ± SD.
Skill Discretion	4	1.5	77	28.7	187	69.8	21.02 ± 2.56
Decision Authority	47	17.5	44	16.4	177	66.0	9.95 ± 1.69
Total of job control	**8**	**3.0**	**87**	**32.5**	**173**	**64.6**	**30.97 ± 3.21**

Table (4): Distribution of levels and mean scores of intensive care nurses' job crafting (n = 268)

Dimensions of job crafting	Low		Moderate		High		Total score
	No.	%	No.	%	No.	%	Mean ± SD.
Increasing Structural Job Resources	48	17.9	8	3.0	212	79.1	12.87 ± 2.49
Increasing Social Job Resources	84	31.3	59	22.0	125	46.6	15.14 ± 3.13
Increasing Challenging Job Demands	72	26.9	32	11.9	164	61.2	12.06 ± 2.51
Decreasing hindering Job Demands	30	11.2	31	11.6	207	77.2	17.45 ± 3.12
Total of job crafting	**39**	**14.6**	**50**	**18.7**	**179**	**66.8**	**57.52 ± 8.53**

Table (5): Relation between total score of artificial intelligence technology perception, job control, and job crafting with intensive care nurses' personal data (n = 268)

Personal Data	Artificial Intelligence Technology Perception Z (Total Score)	Job Control (Total Score)	Job Crafting (Total Score)
Age F(p)	4.318* (0.005*)	8.015* (<0.001*)	15.698* (<0.001*)
Gender t (p)	0.713 (0.476)	1.780 (0.076)	0.121 (0.904)
Marital status t (p)	5.656* (<0.001*)	4.724* (<0.001*)	7.181* (<0.001*)
Residency t (p)	3.884* (<0.001*)	0.521 (0.603)	0.005 (0.996)
Education level F (p)	4.391* (0.005*)	6.712* (<0.001*)	12.477* (<0.001*)
Working unit F (p)	1.007 (0.431)	1.567 (0.135)	1.005 (0.432)
Years of experience F (p)	8.677* (<0.001*)	8.199* (<0.001*)	20.761* (<0.001*)

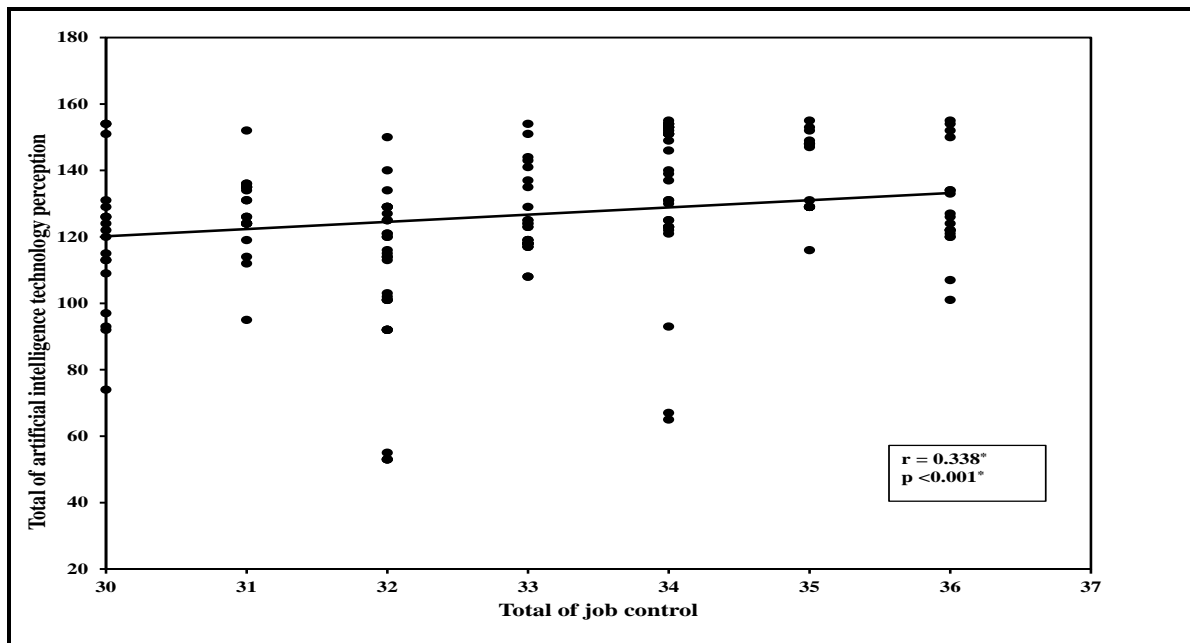*: Statistically significant at $p \leq 0.05$

r = 0.338*
p <0.001*

Figure (1): Correlation between total of artificial intelligence technology perception and job control (n = 268)
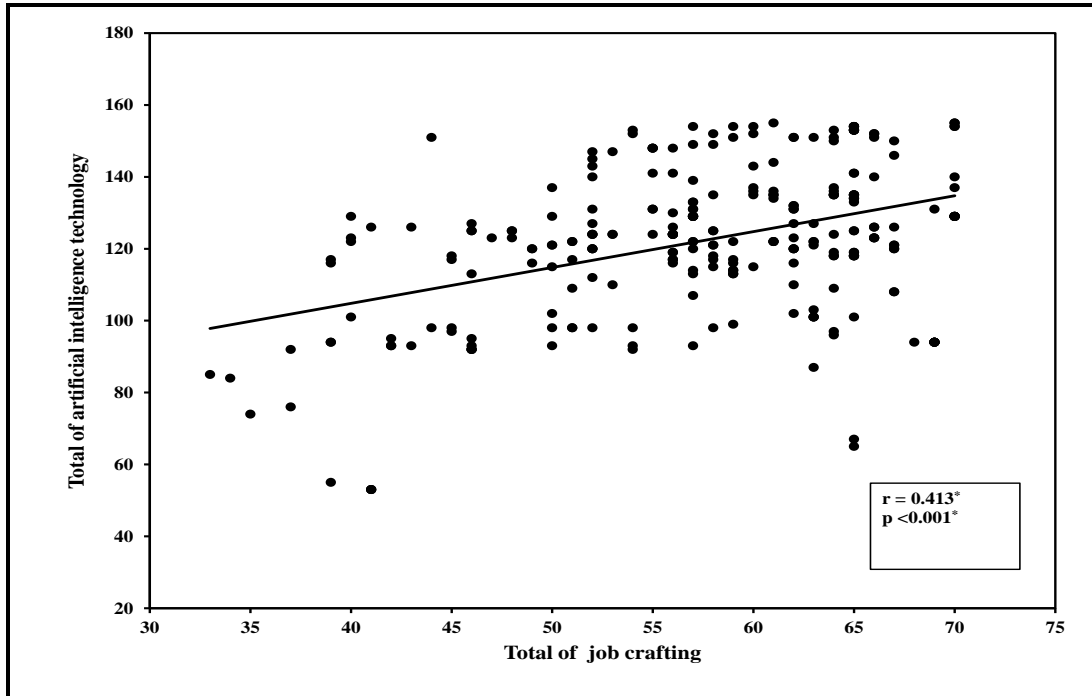
Figure (2): Correlation between total of artificial intelligence technology perception and job crafting (n = 268)
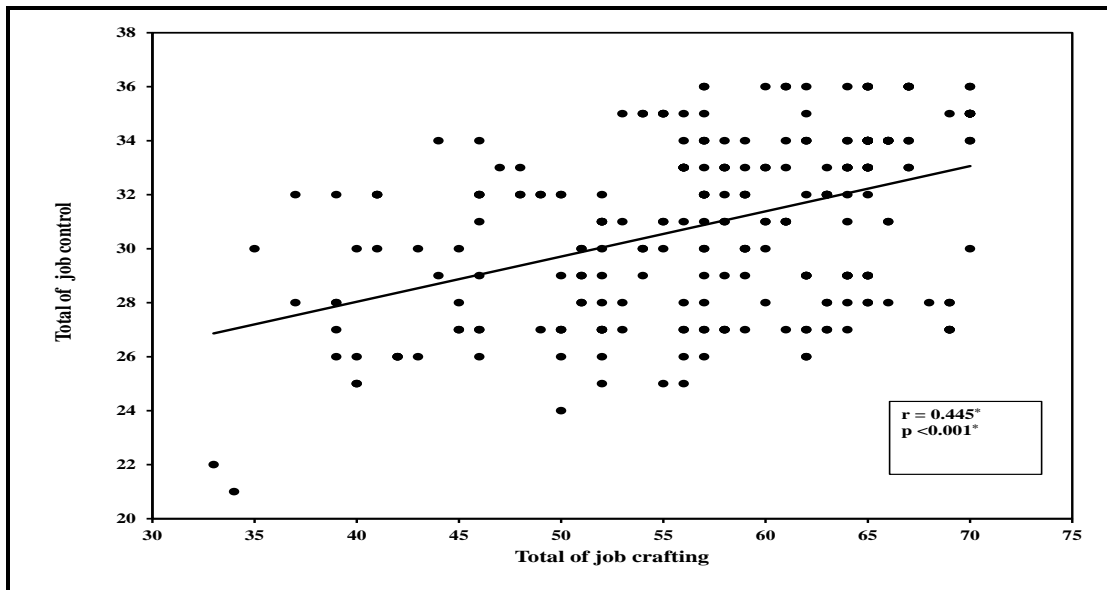

Figure (3): Correlation between intensive care nurses' job control and job crafting (n = 268)

Table (6):   Multivariate linear regression analysis for factors affecting ICNs' job control (n = 268)

	B	SE	Beta	t	p
Artificial Intelligence technology perception (AIT)	0.029	0.009	0.185	3.119*	0.002*
Job Crafting	0.136	0.023	0.360	5.871*	<0.001*
R^2=0.228,adjusted R^2=0.219,SE=2.84,F=25.930*,p<0.001*					

  B: Unstandardized Coefficients   F,p: f and p values for the model R^2: Coefficient of determination
  SE: Estimates Standard error   Beta: Standardized Coefficients   t: t-test of significance
    *: Statistically significant at p ≤ 0.05

Table (1): Displays that about forty-five (44.8%) of intensive care nurses' (ICNs) age range from 25 to less than 35 years old, with mean of 31.54 ± 9.74. While most ICNs (87.3%) are female, and 69% of them are married. Regarding educational level, 39.6% and 37.3% of the studied subjects have an associate degree and a bachelor degree in nursing, respectively. In addition, more than one-third (35.1%) of them are from the neuropsychiatric ICU, and only 1.9% are from the oncology ICU. More than sixty (63.1%) of ICNs are below 10 years of experience, with a mean of 10.61 ± 10.61 years.

Table (2): Shows that about half (50.4%) of ICNs have a high level and 20.1% of them have a low level of artificial intelligence technology perception with mean of 122.3 ± 20.61. Regarding artificial intelligence technology dimensions, about sixty (60.4%) of ICNs have a high level and 20.1 % have a low level of perception of artificial intelligence advantages in health care, with mean of 76.69 ± 13.86.

Table (3): Shows that around two-thirds (64.6%) of ICNs have a high level of job control and only 3% have a low level of job control, with a mean of 30.97 ± 3.21. Also, more than two-thirds (69.8%) of them have a high level, but only 1.5% of them have a low level of the skill discretion dimension of job control. Regarding the mean score of job control dimensions, skill discretion has a (21.02 ± 2.56) higher mean score than the mean score (9.95 ± 1.69) of the decision authority dimension.

Table (4): Displays that more than two-thirds (66.8%) of ICNs have a high level and 14.6% have a low level of job crafting with mean score 57.52 ± 8.53. Regarding the mean score of job crafting dimensions, it is observed that the highest mean score (17.45 ± 3.12) for decreasing the hindering job demands dimension and the lowest (12.06 ± 2.51) for increasing the challenging job demands dimension of job crafting.

Table 5: Shows that there is a statistically significant relation between artificial intelligence technology perception, job control, and job crafting with ICNs' age, marital status, educational level and experience years. Also, there is a statistically significant relation between artificial intelligence technology perception and ICNs' residency at p ≤ 0.05. While there is no statistically significant relation between artificial intelligence technology perception, job control, and job crafting with ICNs' gender and working unit.

Figure (1): Illustrates that there is a statistically significant positive correlation between ICNs' perception of artificial intelligence technology perception and job control where r= 0.338 and p-value <0.001

Figure (2): Displays that there is a statistical significant positive correlation between ICNs' perception of artificial intelligence technology perception and job crafting where r= 0.413 and p-value <0.001

Figure (3): Demonstrates that there is a statistical significant positive correlation between ICNs' job control and job crafting, where r=0.445 and p-value <0.001.

Table (6): Displays multivariate linear regression factors affecting ICNs' job control. Based on the multiple regression analysis to test the direct effect of artificial intelligence perception and job crafting on job control, it is observed that there is a positive and significant correlation between artificial intelligence perception, job crafting, and job control according to the value of F test (F=25.930*, p<0.001*) and the interpreted power of the regression analysis is R2=0.228 as represented by R2.

Discussion

Artificial Intelligence Technology (AIT) has a growing interest in health care organizations; however, healthcare professionals, including ICNs, still have diverse perceptions and attitudes regarding its usage that can influence its successful application **(Sabra et al., 2023)**. Automation provided by AIT is supposed to promote nurses' autonomy and decision-making abilities at higher rates, enhance their analytical skills, and make them more reactive to innovative demands. So that, delicate evaluation and designation of AIT are recommended to motivate nurses' innovative work behavior, job crafting, and job control **(Verma & Singh, 2022)**.

Results of the existing study showed that half of ICNs' had a high level of artificial intelligence technology perception. This might be due to the AIT becomes one of the most important concerns for all health care system administrators to apply, and already, they have begun to equip all health care professionals with critical care regarding its utilization. Also, the latent generations of nurses become more eager to use technology in health care and become very interested in learning more about this technology. This result agreed with **Abd El-Monem et al., (2023)** who discovered that around two-thirds of the studied nurses had a high level of perception toward AIT.

In this respect, **Khalaf et al., (2022)** showed that the largest proportion of ICNs had a moderate level of perception regarding artificial intelligence applications. Additionally, **Abdullah & Fakieh, (2020)** found a moderate perception of AIT among healthcare employees. Furthermore, **Alamanova, (2018)** mentioned that human resources professionals were excited about declining manual labor while

becoming suspicious of adding pointless functions to AI devices. In contrast, **Elsayed & Sleem, (2021)** contradicted the present finding and found that a minority of participants had a high perception regarding utilizing AIT in nursing settings.

The current study found a high ICNs' perception mean score for advantages of using AIT, followed by its application problems in healthcare. This result might be due to the several benefits that come with adopting AIT for them, including the ability to make faster, more accurate decisions, speed up the delivery of healthcare, and be up-to-date with rapidly advancing medical technology. On the other side, the most serious issue with using AIT in nursing care is that it lacks empathy and fails to take the patient's needs and emotional health into consideration, which represents the basis for patient care.

In the same line, **Elsayed & Sleem, (2021)** found that the participants had a high mean score for perception of advantages regarding utilizing AIT, followed by application problems of AIT in healthcare. Also, the current result agreed with **Spatharou, (2020)**, who stated that AIT may increase the effectiveness and productivity of healthcare delivery. AIT can enhance the experience of healthcare professionals, provide them with extra time for direct patient care, and lessen burnout at work. Conversely, **Abdullah & Fakieh, (2020)** revealed that problems with AIT applications in healthcare had the highest score, followed by advantages regarding utilizing them. **Carrol, (2019)** said that the benefits and applications of AIT for nurses are still unclear.

The results of the current study showed that around two-thirds of the studied ICNs had a high job control level. This result may be due to high percent of the ICNs have the required skills to perform their job and the authority to make their job decisions. Also, the ICNs provide care for complex critically ill patients in ICUs, which requires them to be more creative and continuously develop their own abilities, in turn giving them more control on their job. This finding agreed with **Elnady et al., (2023) & Yamaguchi et al., (2016)**, who discovered that a high percent of ICNs had a high job control level. In this respect, **Zein, (2019) & Nasabi & Bastani, (2018)** found that the studied nurses had a moderate job control level. The current finding contradicted **García et al., (2018)** who found most nurses had a low level of job control.

Regarding the mean score of the job control dimensions, the current research found that skill discretion had a higher mean score than the mean score of the decision authority dimension. This result may be due to the fact that about two-thirds of those ICNs had an associate or bachelor's degree, which can reflect on promoting their job-related skills and also they have the opportunity to develop their own

capabilities. In the same line, **Abadi et al., (2021)** found that skill discretion had a higher mean score than the mean score of the decision authority dimension.

Findings of the current study revealed that more than two-thirds of ICNs had a high job crafting level. This finding can be explained by ICNs, one of the health care sectors that work under major pressures and stressors, including increased acuity of patient care, scarcity of resources, nursing shortage and other environmental changes. All of these require them to make compulsive physical, cognitive, and relational changes in order to be adaptable to this momentarily changing world.

In the same context, **Elnady et al., (2023)** clarified that around two-thirds of ICNs had a high level of job crafting. Also, the results of this study align with the findings from prior studies such as **Gouda et al., (2021); Baghdadi et al., (2021);** and **Demerouti et al., (2015)**, who reported that the participants had a high job crafting level. The current study's result is not consistent with **Basiony & Ghonem, (2023)** who declared that the majority of studied nurses, including ICNs, had a moderate job crafting level, and a low percent of them reported a high level. Additionally, **Abou Shaheen & Mahmoud, (2021) & Saad & Ahmed, (2020)** contradicted the findings of the current study and indicated that the majority of ICNs reported a low job crafting level. Also, **Huang et al., (2020)** discovered that the level of job crafting was moderate.

Regarding the mean score of job crafting dimensions, the current research found that the highest mean score was for decreasing the hindering job demands dimension and the lowest for increasing the challenging job demands dimension of job crafting. This outcome could be related to ICUs, work settings where nurses suffer from high workloads, role ambiguity, and work-life conflict, as well as the problem of a nursing shortage, which can restrain their desire to take on more job challenges. So on, ICNs try to decrease these oppressive demands by adjusting their job tasks to make their work environment align with their needs and abilities, making their jobs physically, mentally, and emotionally less intense.

The current finding was confirmed by **Cheng et al., (2020)**, who found that the element of decreasing hindering job demands obtained the highest score. Also, **Abou Shaheen & Mahmoud, (2021)** found that ICNs' lowering hindering job demands had the highest mean score. Contrary to these findings, **Baghdadi et al., (2021); Badran & Akeel, (2020);** and **Dubbelt et al., (2019)** uncovered that decreasing job demands had the lowest mean score.

Results of the existing study showed that there was a significant statistical relation amongst AIT perception, job control, and job crafting with ICNs' age, marital status, educational level, and experience years. Also, there was a significant statistical relation between AIT perception and ICNs' residency. While, there is no statistically significant relation between AIT perception, job control, and job crafting with ICNs' gender and working unit. This finding could be explained by the general readiness of all health care professionals at variant ages to adopt these technologies, specifically the highly qualified recent generations of ICNs who depend more on technological devices, including smart phones and other devices, in their education, life, and jobs. Those devices keep ICNs look forward for identifying and utilizing these technologies in order to control, adjust, and redesign their jobs.

These results were consistent with **Khalaf et al., (2022)** who found highly significant statistical differences between AIT applications' perception levels with educational qualification. Also, **Elsayed & Sleem, (2021)** found a significant positive relation among the studied sample educational levels and their perception concerning utilizing AIT. In addition to, **IJsebaert, (2019)** who demonstrated that education significantly improves AIT attitudes. In the same context, **Zein, (2019)** showed a significant relation among nurses' age, years of experience, education, and job control. Also, there is no relation between nurses' sex and job control.

Also, **Elnady et al., (2023)** declared that there were highly statistically significant relations found between ICNs' educational qualifications, age, experience years, and job crafting. Also, he discovered no statistically significant relations were found between nurses' sex and job crafting. **Abou Shaheen & Mahmoud, (2021)** found that there was a positive statistical significant relation between job crafting and ICNs' personal data concerning experience years. **Saad & Ahmed, (2020)** also displayed a highly significant relationship amongst job crafting and age, years of experience, as well as educational level.

Contradictory, **Khalaf et al., (2022)** disagreed with the current finding and found that there wasn't statistically significant relation between AIT applications perception levels with age, years of experience, and gender of the studied nurses. **Abdullah & Fakieh, (2020)** indicated that no significant differences in nurses' perception or educational level. Also, **IJsebaert, (2019)** asserted that differences in AIT attitudes at work are mainly not caused by age.

Additionally, the study results disagree with **Basiony & Ghonem, (2023)** where there was no statistically significant relation between job crafting level and

staff nurses' ages, gender, marital status, educational qualifications, and experience. Furthermore, **Federici et al., (2019)** contradicted the existing results and indicated that it is more common for single nurses to craft their jobs. Similarly, **Demerouti et al., (2019)** found that age and marital status did not have an impact on job crafting.

The existing findings declared that there was a statistically significant positive correlation between ICNs' perception of AIT and job control. This may be because AIT gives ICNs greater control over their work, improves their ability to make more accurate judgments for their patients, and triggers the need to learn new skills to cope with AIT. In this respect, **Li et al., (2023)** stated that, in the short run, workforce skills might not meet the demands of the new technologies. AIT may therefore result in a mismatch between labor capabilities and the requirements of emerging technology. Therefore, individuals seek to acquire new skills to have more control over their job. In agreement with the current findings, **Verma & Singh, (2022)** indicated that AIT supports task characteristics including skill variety and job autonomy, which reflect job control. **Xua & Lib, (2020)** mentioned that artificial intelligence boosts work autonomy, but each individual will use AIT to a different extent, which is a sign of unique job autonomy and in turn affects job control.

The existing finding declared that there was a statistically significant positive correlation between nurses' perception of AIT and job crafting. This finding indicates that AIT has the potential to alter the way ICNs function in the workplace by increasing job crafting. So, ICNs must adapt to the AIT in the work scene. Therefore, ICNs need to redefine the meaning of their work. In this context, **Cheng et al., (2023)** indicated that organizational AIT adoption leads to promotion-focused job crafting behaviors.

Also, **Li et al., (2023)** mentioned that AIT lowers labor demand, which affects job crafting. **Deshpande et al., (2023)** stated that using AI-enabled devices in hospitals affected the work of nurses and suggested that they would be able to spend more time communicating with patients and other healthcare professionals, thus boosting job crafting. Also, **Xua & Lib, (2020)** mentioned that each employee's working style and behaviors are affected by AIT.

The existing finding showed that there was a statistically significant positive correlation between ICNs' job control and job crafting. In fact, the term job crafting describes the intentional actions people take to reshape and mold their jobs so they better suit their interests, motivations, and strengths. When nurses participate in job crafting, they might alter certain aspects of their job, such as the tasks they choose to do, their interactions with colleagues, or the

way they handle their responsibilities. Nursing professionals' sense of control and autonomy over their work is boosted when they engage in job crafting, which in turn improves their quality of life in the workplace.

In agreement with the current finding, **Elnady et al., (2023)** found that engaging in job crafting permits ICNs to have a sense of control on their work. Additionally, **Ingusci et al., (2021)** declared that job crafting can empower nurses and provide them a sense of ownership and control on their work.

Finally, the AIT is an imperative tool in critical care nursing. The ICNs need to embrace, develop, and expand it in their jobs to obtain its value and maximize productivity. Truly, the AIT can burden and increase nurses' job strain, which can impact negatively on their well-being. Therefore, job crafting is vital for ICNs to change how their jobs are perceived to balance their responsibilities and have more control on their job.

Conclusion

According to the research findings, ICNs had a high level of artificial intelligence technology perception, job control, and job crafting. Furthermore, there was a statistically significant positive correlation between ICNs' artificial intelligence technology perception, job control, and job crafting. It was concluded that artificial intelligence technology perception affects ICNs' job control and job crafting.

Recommendations

In light of the study's findings, the following recommendations will be made:

At management level:
- Conducting workshops and training programs about AIT for ICNs to provide pertinent information regarding its advantages and problems in nursing settings.
- Creating and disseminating an AIT manual to ICNs in order to increase their knowledge of AIT applications in healthcare contexts.
- Assessing and implementing the ongoing training programs for ICNs, emphasizing the importance of job crafting in various work settings.
- Providing opportunities for ICNs to attend and participate in training programs about AIT, job crafting, and job control.
- Creating a supportive working environment that enhances ICNs' job control and job crafting.
- Regular evaluation of ICNs' performance and giving periodic feedback to enhance their potential and competencies.
- Providing nurse managers and supervisors with job crafting techniques so they may establish productive work environments for their ICNs.

- Conducting monthly ICNs' self-assessment regarding AIT perception, job crafting, and job control.

At intensive care nurses level:
- Be health coaches, information integrators, and human care providers, assisted by AIT, rather than being displaced by these technologies.
- Providing compassionate and high-quality nursing care, which new technologies may threaten.
- Holding methods and chances that they have to participate in job-crafting behaviors.

Further research
- Efficacy of an educational program about artificial intelligence and its impact on nurses' performance.
- Factors affecting nurses' job crafting and job control.

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