

Metacognitive Factors Influencing Training Retention Among Multidisciplinary Medical Staff

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Abstract

Aim/Purpose: The purpose of this study was to reduce the professional training dropout rate among multidisciplinary medical staff by identifying and analyzing key factors that influence engagement and retention. Specifically, this study aimed to explore how metacognitive factors affect commitment to completing training programs and to develop a causal model that elucidates the relationships between various metacognitive factors and retention outcomes. The intention was to enhance understanding of how these factors collectively contribute to sustained participation and success in professional training. The study emphasizes metacognition—the awareness, regulation, and control of one’s own learning processes. Thus, it contributes to the growing need for evidence-based models that foster reflective, self-regulated, and adaptive learning behaviors among healthcare professionals, who must constantly update their competencies in response to evolving medical technologies and practices.

Introduction/Background: In recent years, multidisciplinary medical staff have faced increasing challenges in completing professional development training, primarily due to heavy workloads, extended working hours, and the complex nature of responsibilities within healthcare systems. These pressures have contributed to a growing dropout rate from training, raising concerns about the long-term sustainability of continuing professional development in the healthcare workforce. Nevertheless, the constant and rapid evolution of medical technologies and field practices necessitates that healthcare professionals remain up to date with emerging knowledge and competencies. Ongoing training is critical not only for maintaining field proficiency but also for ensuring high-quality patient care. To be both effective and sustainable, the training must be designed with consideration for the practical constraints and professional expectations encountered by medical staff. Accordingly, this study aimed to investigate the key factors that influence training retention, with the goal of finding those that enhance the continuity and success of professional training among multidisciplinary medical staff.

Methodology: In this study, a quantitative research design was employed utilizing Confirmatory Factor Analysis (CFA) to examine the proposed model. An online questionnaire was developed based on the concept of metacognition and reviewed by subject matter experts to ensure content validity. Data were collected for three months from 230 multidisciplinary medical staff, recruited through snowball sampling techniques. CFA was performed using the AMOS program, and model fit was assessed through multiple standard indices, including the Chi-square statistic, p -value, Goodness of Fit Index (GFI), Adjusted Goodness of Fit Index (AGFI), and Root Mean Square Residual (RMR), to confirm the adequacy of the measurement model.

Findings: The results showed that six factors influenced the retention and successful completion of professional training among multidisciplinary medical staff: life balance, career advancement, curriculum quality, training methods, organizational support, and interpersonal relationships. The model demonstrated a satisfactory fit to the empirical data, with statistical values as follows: Chi-square = 249.612, df = 225, p = .125, GFI = .900, AGFI = .882, CFI = .993, and RMR = .026. Although the

Chi-square value was not significant ($p = .125 > .05$), the additional fit indices—all of which reflected a strong overall model fit to the empirical data—indicated that the proposed model adequately represented the observed data. These findings highlight the importance of incorporating these factors into training program design to enhance effectiveness and support long-term professional development in multidisciplinary medical staff.

Contribution/Impact on Society: This study contributes to the growing body of knowledge on professional development in the healthcare sector by identifying six factors—life balance, career advancement, curriculum quality, training methods, organizational support, and interpersonal relationships—that significantly influence training retention among multidisciplinary medical staff. The findings offer practical insights for training program designers seeking to improve workforce stability and elevate the overall quality of healthcare services. By addressing these factors, healthcare institutions can enhance staff engagement and reduce professional training drop-out rates, ultimately benefiting workforce knowledge and organizational performance.

Recommendations: Training programs should incorporate flexible training structures that support work-life balance and align with professional growth trajectories. Emphasis should be placed on curriculum quality, supportive policies, and strong interpersonal connections among trainees and mentors. Integrating technological innovations—such as e-training platforms, AI-based adaptive systems, and online reflective tools—can further enhance accessibility, motivation, and engagement. The use of digital environments that promote reflection and peer interaction is recommended to improve long-term retention and satisfaction.

Research Limitation: The primary limitation was the use of snowball sampling, which while practical for reaching diverse healthcare professionals, inherently limited the representativeness and generalizability of the findings. Additionally, the sample size ($n = 230$) may not fully have captured institutional diversity, and the reliance on CFA did not examine wider contextual factors such as institutional policies or organizational culture. Despite these limitations, the findings provide a reliable foundation for subsequent model testing and application in broader healthcare contexts.

Future Research: Future research could apply the proposed metacognitive model to multidisciplinary medical staff in various professional and educational training contexts to examine its impact on training retention and engagement. Integrating the model with digital learning tools, adaptive systems, or simulation-based training may further support personalized and sustainable professional development. Longitudinal studies could track the development of metacognitive awareness and self-regulated learning during training, providing insights into how these factors contribute to sustained participation and professional growth.

Keywords: *Metacognition, factors, retention, training, multidisciplinary medical staff*

Introduction

Human resource development is a critical driver of organizational success and is widely recognized as a strategic investment for enhancing workforce capabilities and supporting sustainable operations (Pimthong, 2014). Its primary aim is to strengthen employees' knowledge, academic competencies, and operational skills to enable them to effectively contribute to organizational objectives (Wetkama, 2017). Accordingly, organizations increasingly promote continuous learning and professional development through structured training and skills enhancement activities.

Training plays a central role in human resource development by improving competencies across professional sectors. Maslow's (1970) hierarchy of needs is often used to guide training design, emphasizing the importance of meeting fundamental human needs to support work motivation and personal growth. Practical training contributes to organizational performance by equipping employees with current knowledge, technical skills, and problem-solving abilities essential in rapidly evolving work environments.

In multidisciplinary medical fields, however, heavy workloads and time limitations frequently hinder participation in training programs, contributing to dropout and reduced engagement. Traditional motivation theories offer limited explanatory power for sustained participation, whereas Self-Determination Theory (SDT) provides a robust framework for understanding long-term engagement (Ryan & Deci, 2017). SDT posits that sustained motivation depends on fulfilling three Basic Psychological Needs—*Autonomy*, *Competence*, and *Relatedness* (Deci & Ryan, 2000). In demanding healthcare contexts, constraints such as limited work-life balance and unclear career advancement pathways often weaken Autonomy and Competence, reducing intrinsic motivation and training persistence.

Professional development in medical contexts builds on SDT's motivational principles and on Adult Learning Theory, which views adults as self-directed, problem-centered learners (Knowles, 1980). Levandowski (2025) highlighted that modern professional environments increasingly require autonomous learning, making metacognition vital for regulating learning processes. Given the need for continuous knowledge updating in multidisciplinary practice (Frenk et al., 2016; World Health Organization, 2018), institutional and national policies—such as those proposed by Boonmee (1999) and Thailand's National Economic and Social Development Plan (2023–2027)—emphasize strengthening medical education, research, and technological innovation through expanded on-site and online training (Office of the National Economics and Social Development Council, 2022).

Metacognition, defined as the awareness, monitoring, and regulation of one's cognitive processes, enables learners to adjust strategies, solve problems effectively, and manage tasks autonomously (Efklides, 2017; Flavell, 1979). As Stanton (2021) noted, metacognitive skills foster planning, monitoring, and reflection, enhancing self-regulated learning and performance. Prior research consistently has shown that metacognitive engagement improves immediate learning outcomes and supports long-term retention, adaptability, and problem-solving.

Despite extensive research on training effectiveness in healthcare, relatively few studies have examined the cognitive mechanisms—particularly metacognition—that sustain training over time (Dignath & Veenman, 2021; Panadero, 2017). Existing models rarely explain how metacognitive processes contribute to training retention, as prior work has focused largely on external constraints such as workloads or organizational support. Addressing this gap is essential for understanding why some medical professionals successfully transfer training into practice, and for developing evidence-based programs that foster long-term professional growth.

Therefore, this study aimed to investigate the metacognitive factors that influence training retention among multidisciplinary medical staff. The findings are expected to advance theoretical understanding in healthcare education and provide practical implications for designing training programs that enhance engagement, reduce attrition, and support continuous professional development in healthcare workforces.

Research Objectives

The study aimed:

1. To examine the impact of metacognition factors on training retention among multidisciplinary medical staff, with consideration for alignment with national-level healthcare upskilling policies and Continuing Professional Development frameworks.
2. To develop and validate a comprehensive causal model of metacognition factors on training retention, to be used as an evidence-based foundation for formulating workforce management strategies and enhancing human capital development within the public health sector.

Literature Review

Self-Determination Theory (SDT) provides an important conceptual starting point for understanding motivation in professional learning contexts. By emphasizing the satisfaction of three basic psychological needs: autonomy, competence, and relatedness—SDT highlights how intrinsic motivation can influence engagement and persistence in training activities (Deci & Ryan, 2000; Ryan

& Deci, 2017). In healthcare environments, where multidisciplinary medical staff face high workloads, diverse responsibilities, and complex tasks, insights from SDT help explain why certain individuals are more likely to sustain participation and take initiative in learning activities. This conceptual foundation underscores the role of motivation in shaping how learners generally approach, prioritize, and commit to their professional development.

Building on this motivational foundation, metacognition—the awareness and regulation of one’s cognitive processes—is crucial for effective training and long-term retention (Flavell, 1979; Zimmerman & Moylan, 2009). It helps trainees monitor and adjust thinking strategies, which is especially valuable in multitasking healthcare settings, enhancing knowledge acquisition, application, and work performance. The literature review confirmed that six key factors, including career advancement, organizational support, activity and training methods, life balance, curriculum, and relationships, play an important role in supporting training retention by influencing metacognitive processes.

Career Advancement

Professional growth opportunities significantly motivate employees to engage in deeper learning and strategic thinking. When training is perceived to align with career advancement, medical staff are more likely to adopt metacognitive strategies such as planning, self-monitoring, and reflective thinking. Recent research has shown that perceived career benefits increase learners’ investment in training programs, thereby enhancing long-term knowledge retention (Zhu & Song, 2022)

Organizational Support

Organizational support, including leadership involvement, infrastructure, and a learning-oriented culture, is crucial for fostering metacognitive behaviors among multidisciplinary medical staff. When employees perceive strong organizational support, they are more likely to self-regulate their learning, apply knowledge effectively in practice, and retain skills over time. Mallah et al. (2024) found that perceived organizational support combined with structured training enhances retention, with workplace behaviors mediating this effect, highlighting the importance of supportive organizational practices. Additionally, policies that prioritize continuous training and professional development further reinforce sustained training retention (Bharadwaj, 2022).

Activity and Training Methods

Activity and training methods play a crucial role in knowledge retention among multidisciplinary medical staff. Research from experimental and longitudinal studies shows that training effectiveness depends on how well activities align with learner needs and clinical contexts (Martin et al., 2018). Various modalities—face-to-face, online, and blended formats—yield different levels of long-term learning outcomes and can enhance metacognitive engagement by prompting learners to plan, monitor, and reflect on their learning. This is consistent with Medina et al. (2017), who highlighted that integrating metacognitive strategies into health profession education strengthens self-regulated learning and supports sustained knowledge retention.

Life Balance

Work-life integration supports healthcare professionals’ metacognitive and self-regulated learning capacities. Excessive stress or burnout can impair self-reflection and persistence, reducing knowledge retention. Evidence has indicated that a balanced personal and professional life enhances goal-directed learning, adaptive training behaviors, and overall performance (Salahuddin, 2025; Ferro et al., 2024). These findings highlight the importance of addressing work-life balance and fostering metacognitive skills in training programs to optimize retention and effectiveness among multidisciplinary medical staff.

Curriculum Quality

A curriculum that integrates metacognition components, such as self-assessment, goal setting, and reflection, promotes long-term knowledge retention, critical thinking, and development of self-regulated learning skills (Gallagher et al., 2012). Curricula with embedded metacognition also allow trainees to monitor their progress and adapt their training strategies accordingly (Zepeda et al., 2019). Regardless of how metacognition is positioned within modules, as standalone outcomes, or as a system-wide goal, it helps trainees take ownership of their training and supports professional development in healthcare settings.

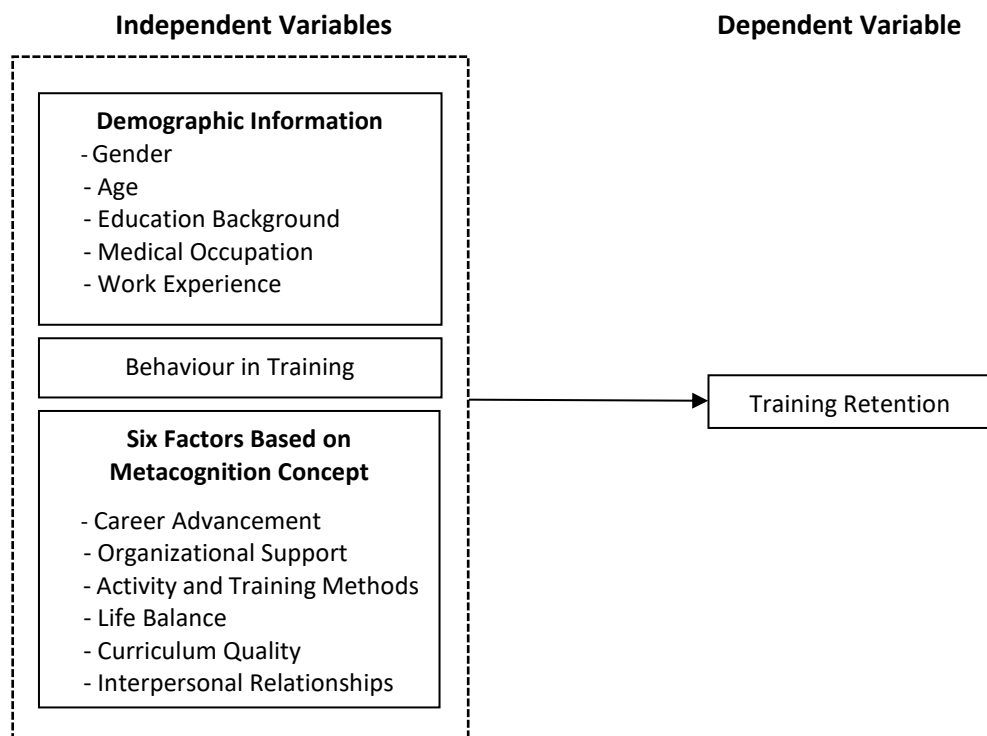
Interpersonal Relationships

Learning in social environments enhances metacognition through collaborative reflection and peer feedback, promoting self-regulation and deeper understanding (Hattie & Timperley, 2007). Trust and supportive relationships within multidisciplinary teams facilitate co-regulation and shared strategic thinking for complex problem-solving. Studies show that team-based learning combined with mentoring significantly enhances reflective awareness and knowledge retention among healthcare trainees, underscoring the role of social support and guided learning in professional development (Liaw et al., 2014).

Conceptual Framework

The study's conceptual framework is shown below in Figure 1.

Figure 1 *Conceptual Framework*



Research Methodology

Population and Samples

The researchers used a snowball sampling method to select participants, and 230 multidisciplinary medical staff participated in this study. This method was chosen because it was practical for reaching healthcare professionals from different disciplines and institutions who were difficult to access through probability sampling techniques. However, as a non-probability sampling approach, it may have limited the representativeness of the sample and affect the generalizability of the findings. All

participants came from 12 professions, including doctors, dentists, pharmacists, nurses, medical technologists, physical therapists, public health officers, veterinarians, animal scientists, sports medicine professionals, medical scientists, and medical researchers. All participants were surveyed on various demographic features including gender, age, educational background, work experience, and behaviors in training. According to the methodological guidelines proposed by Kline (2011), a minimum sample size of 200 is essential to ensure robust statistical analysis in behavioral studies. Accordingly, the sample size utilized in this study aligns with this principle.

Research Instrument

A quantitative cross-sectional survey design was employed to collect data from multidisciplinary medical staff members. The researchers developed a survey that did not require participants to provide any personal information; the survey contained questions in 3 parts. The first part aimed at exploring participants' demographic characteristics and backgrounds. The second part explored participants' training behaviours. In this part, participants had to evaluate themselves through a 5-point Likert scale from Never (1) to Always (5). The last part contained questions aimed at examining six metacognition factors that affect training retention. In this part, participants had to evaluate themselves through 5-point Likert scale items from Never/Strongly Disagree (1) to Always/Strongly Agree (5)

The survey's content validity was assessed by three experts in education and medical professional training. Each item was evaluated using Index of Item-Objective Congruence, and all items received scores above .67, indicating acceptable content validity. A try-out was conducted with 30 participants who had similar characteristics to the target population. The results of the reliability analysis showed that the overall Cronbach's alpha coefficient was .91, indicating a high level of internal consistency. Thus, the instrument was considered valid, reliable, and suitable for use in data collection.

Collection of Data

The researchers conducted the study in accordance with basic research ethical protocols. Ethical clearance was obtained from the Kasetsart University Research Ethics Committee in the form of a Certificate of Exemption prior to data collection. The clearance was issued on 11 May 2023, under Study Code KUREC-SSR66/060.

First, the researchers asked permission from the relevant authorities to allow multidisciplinary medical staff to participate in the study. Next, they prepared a letter that included a description of the research study's objectives, participant confidentiality, survey links, and their contact information. After that, the researchers collected data for 3 months and spent 3 months analyzing it and writing a report.

Data Analysis

In this study, the researchers used descriptive analysis to explore metacognition factors that affected training retention among multidisciplinary medical staff. The researchers used Confirmatory Factor Analysis (CFA) as the statistical method to examine impact of metacognition factors in training retention among the trainees. The model fit was evaluated using standard fit indices such as Chi-square, degrees of freedom (*df*), Goodness-of-Fit Index (GFI), Adjusted Goodness-of-Fit Index (AGFI), Comparative Fit Index (CFI), and Root Mean Square Residual (RMR) at a significance level of .05. AMOS software was used to analyse complex relationships between the dataset variables.

Results

Participant Demographic Information

There were a total of 230 participants in this study. Among them, 171 were females (74.3%) and in the age range of 21–30 years old (74.3%). As shown in Table 1, participants had at least a bachelor's degree ($n=199$, 86.5%), and the two most widely represented professional occupations were 125 nurses (54.3%)

and 45 veterinarians (19.5%). Most of them worked in the public sector ($n= 191$, 82.6%), though some worked in private companies and educational institutions ($n=26$, 11.3%).

Regarding working experience, the largest groups of 70 participants (30.4%) and 99 participants (43.1%) had less than 1 year and 1–5 years respectively.

Table 1 Demographic Information

	Topic	Frequency	Percentage
1.	Gender		
	Female	171	74.3
	Male	59	25.7
2.	Age Rank		
	21–30 years	171	74.3
	31–40 years	44	19.1
	41–50 years	13	5.7
	51–60 years	2	.9
3.	Educational Background		
	Bachelor’s Degree	199	86.5
	Master’s Degree	25	10.9
	Doctor’s Degree	6	2.6
4.	Medical Occupation		
	Nurse	125	54.3
	Veterinarian	45	19.5
	Medical Technologists	11	4.8
	Medical Scientist	9	4.0
	Pharmacist	9	4.0
	Animal Scientist	9	4.0
	Sports Medicine	7	3.0
	Doctor	6	2.6
	Physical Therapist	3	1.3
	Public Health	3	1.3
	Dentist	2	.8
	Medical Researcher	1	.4
5.	Work Experience		
	Less than 1 year	70	30.4
	1–5 years	99	43.1
	6–10 years	40	17.4
	11–15 years	12	5.2
	16–20 years	5	2.2
	More than 20 years	4	1.7
	Total	230	100

Training Experience of Participants

The findings revealed that more than half of the total participants had participated in multidisciplinary medical training program ($n=118$, 51.3%). Separately from this, participants also reported their experiences with other types of training programs of varying durations. A total of 139 participants had attended 1–2 days training programs, 61 had attended 3–4 day programs, and 30 had attended 5–7 days training programs.

As shown in Table 2, most participants indicated that they expected to develop and update their operational knowledge from training participation ($n=207$, 90%). Most expected increase proficiency in their operational skills, ($n=183$, 79.6%), over half of the participants expected to build their professional networks ($n=127$, 55.2%), and a smaller group hoped to receive scholarships in their fields after attending the training program ($n=78$, 33.9%).

Table 2 Training Experience of Participants

Topic	Frequency	Percentage
1. Have you ever participated in a training program for medical personnel before?		
Participated in training	118	51.3
Never participated in training	112	48.7
2. Have you ever participated in a training program for medical personnel before?		
1–2 days	139	60.4
3–4 days	61	26.5
5–7 days	30	13.1
3. Have many hours per week do you think you can participate in activities and attend course training?		
Less than 30 hours	150	65.2
31–40 hours	64	27.8
More than 40 hours	16	7.0
4. What is your expectation for participating in the training program? (Participants can select more than one option.)		
Update operational knowledge	207	90.0
Develop more proficient operational skills	183	79.6
Build connections	127	55.2
Receive a scholarship	78	33.9
Total	230	100

Metacognition Factors Affecting the Training Retention

The findings revealed that six metacognition factors affected the training retention of participants, which included curriculum quality, activity and training method, career advancement, organizational support, interpersonal relationships, and life balance; see Table 3. Those factors significantly increased the motivation and engagement of participants throughout the training process. Participants reported a high level of agreement with these factors ($\bar{x} = 4.31, SD = .02$), indicating strong perceptions of their importance in supporting training retention.

Table 3 Factors Based on Metacognition Affecting Training Retention

Factors	Mean (\bar{x})	Standard Deviation	Level of Opinion
Curriculum Quality	4.27	.11	High
Activity and Training Method	4.30	.07	High
Career Advancement	4.42	.05	High
Organizational Support	4.32	.09	High
Interpersonal Relationships	4.26	.06	High
Life Balance	4.30	.88	High
Total	4.31	.02	High

In terms of the curriculum quality, the results revealed that modernization, training program objectives, skills and knowledge gained after training, the length of the training, specific training topics, and the training evaluation all contributed to a high level of retention ($\bar{x} = 4.27, SD = .11$).

The activity and training methods factor revealed that engaging in analytical tasks, participating in case study discussions, involvement in wrap-up sessions, and use of online training formats were significant contributors to high levels of training retention ($\bar{x} = 4.30, SD = .07$).

For the career advancement factor, the results suggested that when multidisciplinary medical staff gain opportunities for professional progress, such as being promoted to higher positions or moving to new roles that differ from their current responsibilities, these elements contributed to a high level of training retention ($\bar{x} = 4.42, SD = .05$).

Regarding the organizational factor, the analysis showed that institutional support, particularly in providing time flexibility and encouraging participation in training sessions, played a critical role in enhancing training retention among medical personnel ($\bar{x} = 4.32, SD = .09$).

The relationship factor indicated that maintaining positive interpersonal connections with fellow trainees, speakers, consultants, and training organizers had a substantial influence on training retention ($\bar{x} = 4.26, SD = .06$).

Lastly, the life balance factor showed that elements such as physical and mental well-being, relaxation and personal flexibility, supportive environments, and family considerations, along with the ability to customize training to individual needs, greatly enhanced training retention among multidisciplinary medical staff ($\bar{x} = 4.30, SD = .06$).

Based on the conceptual framework in Figure 1, Confirmatory Factor Analysis (CFA) was conducted to validate the proposed relationships among metacognition factors and their impact on training retention. As shown in Table 4, all standardized factor loadings were significant and consistent with the data, confirming that the observed variables effectively represented their constructs. The model fit indices indicated a good fit: $\chi^2 = 266.145$ ($p = .061, df = 232$), GFI = .917, AGFI = .884, CFI = .990, and RMR = .024. They also collectively confirmed the model's adequacy and consistency with the empirical data. Detailed CFA results, including factor loadings and model fit statistics, are provided in Table 4, Table 5, and Figure 2.

Table 4 Factor Loadings for the Measurement Items

Variables	Item	Standardized Loading
Curriculum	C1	.68
	C2	.76
	C3	.77
	C4	.70
	C5	.80
	C6	.61
Activity and Training Method	A1	.58
	A2	.55
	A3	.70
	A4	.30
	A5	.55
Career Advancement	G3	.75
	G4	.72
	G5	.75
Organizational Support	O1	.85
	O2	.90
Interpersonal Relationships	R1	.75
	R2	.84
	R3	.85
	R4	.77
Life Balance	L1	.87
	L2	.85
	L3	.69
	L4	.80
	L5	.55

Chi-square = 266.145; degrees of freedom (df) = 232; $p = .061$; Goodness-of-Fit Index (GFI) = .917; Adjusted Goodness-of-Fit Index (AGFI) = .884; Comparative Fit Index (CFI) = .990; Root Mean Square Residual (RMR) = .024; Root Mean Square Error of Approximation (RMSEA) = .025

When considering all factors, it was found that the curriculum factor contained six questions with factor loadings ranging from .61 to .80. The activity and training method factor included five questions, with loadings ranging from .30 to .70. Although one item (A4) had a relatively low loading of .30, it was retained based on item-level diagnostics, including corrected item-total correlation and theoretical relevance to training engagement, ensuring that construct's key aspects were adequately represented. For the career advancement factor, three questions showed loadings between .72 and .75. The parent organization factor consisted of two questions with loadings between .85 and .90. The

relationship factor had four questions with loadings from .75 to .85, while the life balance factor contained five questions with loadings ranging from .55 to .87. These results reflect alignment with the study’s conceptual framework and research objectives, which aimed to examine how multiple metacognition-related factors influence training retention among medical staff and support alignment with national healthcare upskilling policies and Continuing Professional Development frameworks.

The researchers conducted a second-order confirmatory factor analysis in AMOS to examine the survey’s construct validity; its results are presented in Table 5. Six metacognition factors were identified, with a Residual (RMR) value of .026, indicating good consistency between the proposed model and the empirical data. The analysis was complemented by descriptive insights into participants’ training behaviors and demographic characteristics, which helped contextualize the findings and reinforced the role of each factor in the overall causal model of training retention. These results provide an evidence-based foundation for workforce management strategies and human capital development initiatives within the public health sector.

Table 5 Results of Second-Order Confirmatory Factor Analysis

Factors	Result Analysis			
	<i>r</i>	SE	<i>t</i>	<i>r</i> ²
Curriculum Quality	.89	.13	6.95	.79
Activity and Training Methods	.88	.12	6.73	.78
Career Advancement	.92	.14	8.24	.84
Organizational Support	.87	.14	8.65	.76
Interpersonal Relationships	.81	.14	8.40	.66
Life Balance	.96	-	-	.92

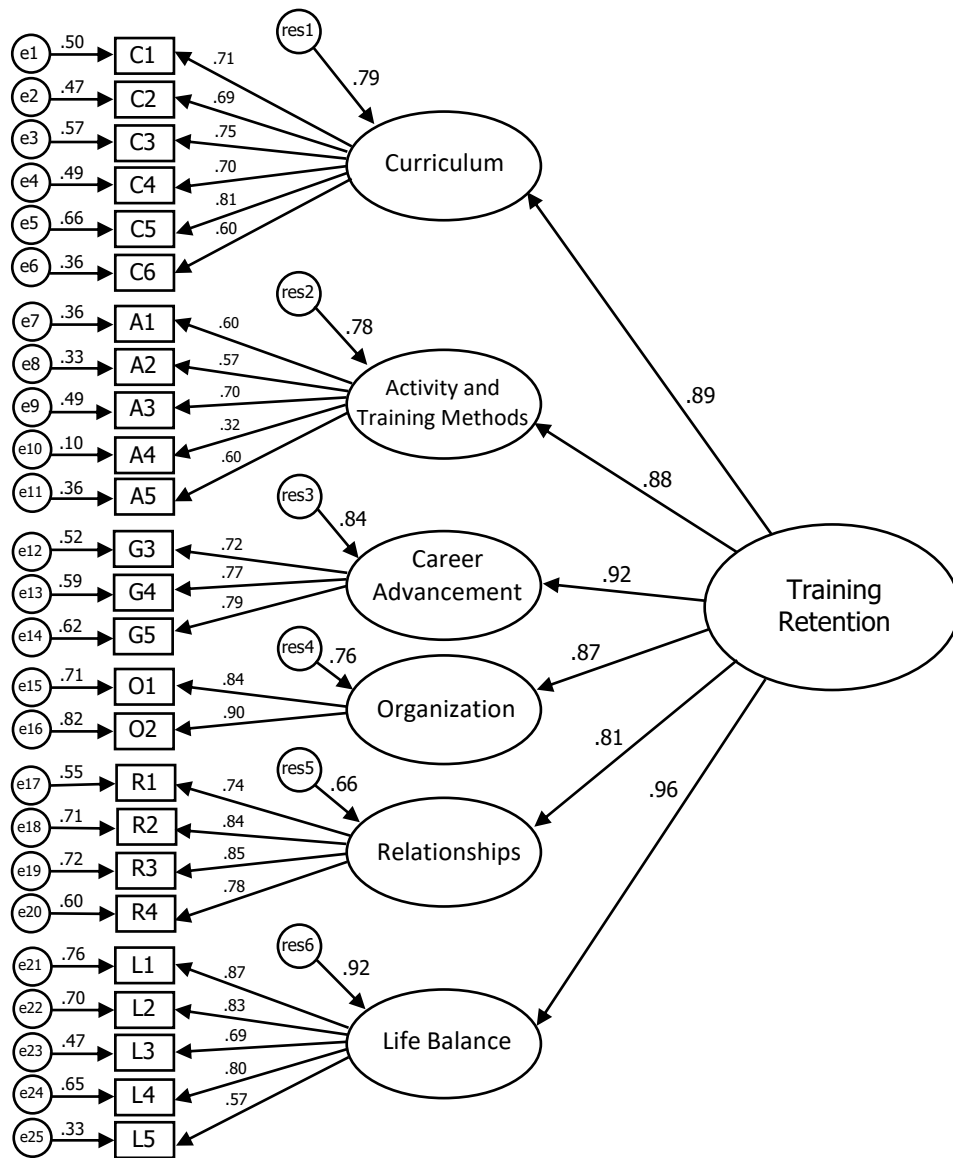
Chi-square = 249.612; *df* = 225; *p* = .125; GFI = .917; AGFI = .884; CFI = .990; RMR = .026; RMSEA = .022

From Table 5, the Chi-square test of the model ($\chi^2 = 249.612$, *df* = 225, *p* = .125) suggested that the model fits the data well, as indicated by the non-significant *p*-value, implying that the model's implied covariance matrix did not differ significantly from the observed covariance matrix. The Goodness-of-Fit Index (GFI = .919) and Adjusted Goodness-of-Fit Index (AGFI = .882) both confirmed a good fit, although the AGFI was slightly lower due to adjustment for the number of parameters estimated. The Comparative Fit Index (CFI) was .993, indicating that the model was highly consistent with the observed data. Furthermore, the Root Mean Square Residual (RMR) was .026, and the Root Mean Square Error of Approximation (RMSEA) was .022, which represented an excellent model fit.

Factor loading for all factors ranged from .81 to .96, showing positive relationships with training retention among participants. Moreover, the coefficient of determination (*r*²) values ranged from .66 to .92, indicating that the model explained 66% to 92% of the variance in training retention. Specifically, the “Life Balance” factor had the highest (*r*²) value of .92, indicating it explained 92% of the variance in training retention, while the “Relationship” factor had an (*r*²) value at .66, explaining 66% of the variance. These results highlighted that different metacognition factors contribute variably to training retention and underscored the importance of considering life balance and interpersonal relationships when designing training programs for multidisciplinary medical staff.

Figure 2 presents a model based on the second confirmatory factor analysis. In Figure 2, the second confirmatory factor analysis showed that the model was consistent with the empirical data, which is shown by the Chi-square value of 249.612; *p* = .125 with 225 degrees of freedom, a Goodness of Fit index (GFI) of .919, an Adjusted Goodness of Fit Index (AGFI) of .882, and a Comparative Fit Index (CFI) of .993. The factor loadings for all factors were statistically significant at the .05 level, indicating that all 25 questions could be measured according to the hypothesis model.

Figure 2 Model of the Second Confirmatory Factor Analysis



Chi-square = 249.612, $df = 225$, $p = .125$, CMIN/DF = 1.109
 RMSEA = .022, CFI = .993, GFI = .919, AGFI = .882, RMR = .026

Discussion

In the study, six key factors were identified that influence training retention among multidisciplinary medical staff that can be understood through the integrated lens of Metacognition and the Self-Determination Theory (SDT). Effective retention depends not only on trainees’ ability to apply metacognitive strategies such as self-monitoring and reflection, but also on the motivational conditions that sustain such effort. According to SDT, optimal motivation arises when three innate psychological needs, Autonomy, Competence, and Relatedness, are satisfied (Ryan & Deci, 2000). The empirical findings of this study validated SDT within the medical training context, emphasizing that organizational structures supporting these psychological needs are essential for maintaining autonomous motivation and long-term metacognitive engagement.

Among these, the life balance factor emerged as the most influential predictor of training retention. This reflects the critical need for autonomy in a high-stress medical environment (Hreha, 2023). When institutions promote flexible scheduling or workload adjustments, trainees experience greater control over their learning processes, leading to enhanced motivation and cognitive capacity

(Agu et al., 2021). This reduction in cognitive strain allows medical staff to allocate mental resources toward self-regulation, monitor progress, and apply metacognitive control core mechanisms that strengthen knowledge retention. In essence, work-life balance does not merely increase satisfaction but functions as an enabling condition that supports sustained metacognitive effort.

Career advancement was another key factor, corresponding to the SDT need for competence. Opportunities for professional growth and recognition signal organizational investment in employee mastery, thereby fostering intrinsic motivation to persist in training and improve performance. When staff perceive that training contributes to their long-term career trajectory, they engage more deeply in reflective learning and self-assessment, reinforcing both competence and metacognitive awareness. This was aligned with SDT's proposition that competence enhancing environments fosters autonomous motivation and sustainable learning behaviors.

The curriculum, activities, and training methods strongly influence learning outcomes in medical staff. Programs combining interactive content, active learning strategies, and digital tools enhance engagement, comprehension, and long-term retention, while asynchronous, self-directed modules offer flexibility for busy healthcare professionals. Consistent with Ho et al. (2023), integrating digital and active-learning approaches within autonomy-supportive and competence-building frameworks not only meets basic psychological needs, but also fosters metacognitive skills such as goal setting, planning, and self-evaluation, transforming training into active, self-regulated learning. Similarly, Vallee et al. (2022) highlighted that blended and self-paced models improve engagement and long-term outcomes.

Organizational support further reinforces training retention by creating motivational infrastructure for sustained learning. Policies such as protected learning time, performance-based incentives, and transparent promotion pathways enhance participation and motivation. This structural support satisfies both autonomy (through empowerment) and competence (through recognition), thereby facilitating deeper metacognitive engagement. Although interpersonal relationships received a lower rating in this study, emerging evidence underscores their relevance. Peer networks and mentoring relationships enhance professional identity and sustained engagement (Krishna et al., 2024). These social connections support relatedness, a fundamental SDT need, while simultaneously contributing to team resilience and collaborative problem-solving, which are essential for the sustainability of multidisciplinary training environments.

While the present findings establish clear relationships between these six factors and training retention, future research should examine moderating or mediating effects of contextual variables such as age, years of service, and occupational type. For instance, early-career professionals may depend more on structured organizational support, while senior staff may derive greater motivation from autonomy-supportive frameworks. Such analysis could reveal subgroup differences, enriching the theoretical understanding of how motivation and metacognition interact across professional stages.

Overall, this study provides evidence that the sustainability of training retention among multidisciplinary medical professionals relies on the interplay between motivational fulfillment (as proposed by SDT) and metacognitive engagement. These insights extend current theories by showing that metacognition is not purely cognitive, but it is also dynamically influenced by motivational and organizational contexts.

Contributions to Theory and Practice

This study advances the integration of Self-Determination Theory and Metacognitive Theory by demonstrating that motivation acts as a mediating mechanism sustaining metacognitive engagement and training retention. It extends SDT by applying its psychological needs for Autonomy, Competence, and Relatedness to explain differential impacts of six contextual factors on learning persistence among multidisciplinary medical staff. The findings reveal that training retention is best conceptualized as a motivationally sustained metacognitive process, where cognitive self-regulation and motivational support interact continuously.

Conclusion

In conclusion, this study emphasizes that designing effective training programs requires a balanced integration of multiple contextual and psychological factors. A curriculum that aligns with professional needs and incorporates engaging, learner-centered methods fosters both motivation and metacognitive engagement. When training is connected to meaningful career advancement opportunities, participants are more likely to internalize learning goals and apply new knowledge effectively in their professional contexts.

Equally important is organizational support, which ensures that trainees have the structural and emotional resources necessary to sustain participation. Supportive workplace cultures that value collaboration and flexibility help maintain learner motivation and reduce cognitive strain, while promoting healthy work-life balance further enhances engagement and well-being.

Taken together, these findings underscore that training effectiveness extends beyond instructional design. It depends on how institutions cultivate an environment that satisfies the need for autonomy, competence, and relatedness. Integrating these principles holistically not only strengthens knowledge retention, but it also supports long-term professional growth and the sustainability of multidisciplinary training initiatives.

Suggestions for Further Research

The study provides valuable insights into the metacognition factors that significantly influence training retention among multidisciplinary medical staff. Through confirmatory factor analysis, six key factors were identified: life balance, career advancement, organizational support, training methods, curriculum design, and interpersonal relationships. Among these, life balance was the most influential, highlighting the importance of personal well-being in professional development. At the same time, career advancement also played a pivotal role in motivating staff to remain engaged and update their competencies. Although interpersonal relationships had the lowest statistical impact, they still contributed to a supportive learning climate and fostered long-term motivation.

The findings underscore the need for training programs that integrate flexibility, promote work-life balance, and align with individual career objectives, together with organizational support such as adequate time allocation, scholarships, recognition for training completion, and access to learning resources. High-quality curricula, supported by institutional frameworks and digital technologies, can further enhance accessibility, personalize learning experiences, and reduce disparities in training opportunities. By incorporating these elements, training initiatives can achieve sustainable learning outcomes while promoting professional excellence for multidisciplinary medical staff.

Future research should consider applying this training model to healthcare professionals operating within diverse contextual settings, such as nurses, physical therapists, community public health practitioners, and veterinarians. This would facilitate investigation of its effectiveness across professional domains, including potential moderating factors that may influence training outcomes among different groups of practitioners.

Moreover, future studies may also explore integrating this model into the design of training programs, curricula, and activities that incorporate digital technologies such as online platforms, simulation systems, AI-assisted training tools, and training analytics. Such integration would aim to enhance personalized learning experiences and reduce disparities in professional development opportunities among healthcare personnel. The researchers believe that the findings from these investigations would contribute to the empirical evidence supporting the model's practical applicability and its potential to foster effective and sustainable development of healthcare professionals.

Author Contributions

Chavisa Warnathong: Conceptualization, methodology, validation, formal analysis, investigation, data curation, writing – original draft, writing – review & editing, visualization, project administration;

Watsatree Diteeyont: Conceptualization, validation, writing – review & editing, supervision.

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