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Exploring an online metacognitive intervention on young and mature employees: A preliminary study

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Abstract

With sufficient metacognitive knowledge and action, employees are better equipped in their time and work management, avoiding any unproductive behaviour. Metacognitive strategies thus equip them with the need to learn and develop their career resilience, especially the young and mature working adults. As there are limited intervention studies exploring the metacognition of both young and mature employees, the present study investigated a metacognitive intervention to promote adaptability and career resilience. It explored the metacognitive strategies that include planning, monitoring and evaluating and examined the differences of various outcome variables (e.g., adaptability, critical thinking and career resilience). A total of 71 participants were recruited, and they underwent an eight-week metacognitive intervention. Pre- and post-questionnaires were administered before and after the intervention. Key findings indicated that the group difference was insignificant, suggesting the importance of metacognitive strategies in supporting adaptability and career resilience for young and mature employees. Finally, limitations to the study were presented, and recommendations were made for future workplace research and practice.

Introduction

The massive technological advances in today's world demand metacognitive strategies to upskill and upgrade (Drigas et al., 2023). Metacognitive strategies such as self-regulation and monitoring are essential skills for self-development and personal growth. With sufficient metacognitive knowledge and action, employees are better equipped in their time and work management, avoiding any unproductive behaviour. Metacognitive strategies also equip them with the need to learn and develop their career resilience. There are limited empirical studies investigating metacognitive interventions on young and mature employees. Specifically, the effectiveness of an online metacognitive intervention on young and mature employees is yet to be investigated.

Current employees may be more socially adaptable as they prefer not to stay at one job for long. Instead, they would rather move on to the next job if the current job does not meet their expectations (Ng & Kong, 2022). One key question is, are our young graduates more agile in their learning, such that they can venture into a new workplace easily? On the other hand, are our mature employees less agile and adaptable than young people in gaining employment and employability? These are concerns relating to lifelong employability whereby the means of securing one's job is not reliant on growing national and global policies but the processes of lifelong learning among individuals (Ng, 2022). Lifelong employability herein refers to learning agility and social adaptability in today's current context is necessary. To meet the demands of today's global economy, it is important to support individuals' continuous learning across working life and address their needs associated with work goals, so that they stay relevant and sustain their employability (Chung & Chapman, 2023; Le et al., 2023).

As there are limited studies in this field of research, it is important to examine any changes in employees' learning agility and social adaptability that may influence their career resilience. It is also meaningful to understand whether metacognitive strategies differ between the two groups of employees (i.e., young and mature) and any effect on skills development in the transition from education to employment. The findings of the study add value to both the educational and industry landscapes by equipping employees with metacognitive strategies that are of key relevance to the evolving workforce and global economy. Finally, the study provides some insights to mitigate the impact of potential job losses and nurture lifelong employability among young and mature employees.

Literature review

Metacognition

Metacognition refers to all aspects of cognitive self-regulation that can be cross-disciplinary and applied in the areas of industry and education (Bell, 2017). Metacognition can influence how learners allocate their effort, evaluate their progress toward desired objectives, and react to their goal progress. Metacognition is also about one's creativity in generating innovative and unique solutions to complex problems (Hargrove & Nietfeld, 2015).

Due to technological globalisation and the evolving world economy, the workplace requires metacognitive skills for acquiring and applying knowledge (OECD, 2022). Metacognitive skills refer to the ability to think about thinking that includes monitoring and control processes (Flavell, 1979; Metcalfe & Shimamura, 1994). Monitoring refers to identifying the task, assessing and evaluating one's own progress. Control processes include decision-making such as allocating one's cognitive resources and intensity at which to work on a task and prioritising various tasks at hand (Schmidt & Ford, 2003). Metacognitive interventions aim to increase the effectiveness of more autonomous or self-directed learning in workplaces.

Learning agility, social adaptability, and career resilience

Learning agility refers to an individual's ability and willingness to learn from experience and apply the lessons of experience to improve future performance (DeRue et al., 2012; Lee & Song, 2022). Learning agility is also about coming up to speed quickly and thinking flexibly about current experience. As such, learning agility could contribute to social adaptability during job transitions or new roles in workplaces. It is likely that individuals who know themselves well, learn from experiences, and adapt to social situations are resilient under the pressures of change.

Social adaptability is defined as the proficiency in adapting one's actions to current social contexts (Baron & Tang, 2009). Social adaptability is also the ability to adjust one's behaviour to a wide range of rapidly changing situations (Baron & Markman, 2003). Only one study examined employees' occupational adaptability (i.e., creating and maintaining a positive relationship with their work environment) and social adaptability in a private organisation (Abdulshah et al., 2017), indicating a significant positive relationship between occupational adaptability with social adaptability. Social adaptability also relates to adjusting to the environment by being socially responsible. Adaptability, which may be perceived as context-dependent or the degree of flexibility to adjust within a given work context, shares similarities to creative thinking. Creative thinking is defined as "creating new knowledge or adapting to tasks in new ways and thus contributing novelty to the effective and efficient nature of routine expertise" (Gube & Lajoie, 2020, p. 8). Routine expertise refers to the regular tasks at the workplace. Hence, the social adaptability herein includes social responsibility, adaptability and creative thinking.

Career resilience is defined as the "capacity to continue making progress toward your current career goals with the resources and strategies" one has already developed (Pipe et al., 2012, p. 245). Career resilience is also the capacity to find and maintain a job, make proper job transitions, and lead a satisfied life (Tien & Wang, 2017). A recent study indicated that career resilience mediated the relationship between career competency (i.e., self-management of career goals and progression) and career success (Ahmad et al., 2019). There is increasing evidence of the importance of career resilience for the modern worker, with career competency

being a significant predictor of career resilience, which subsequently is a significant predictor of career success. Resilient workers can self-manage their careers, continue to learn, and adapt to unpleasant events (Ahmad et al., 2019). Together, the outcome measures of learning agility, social adaptability and career resilience would illustrate a holistic approach to employability in the 21st century among young and mature employees.

Existing metacognitive intervention and empirical studies

Skulmowski and Rey (2017) and Teng (2017) both examined the connection between task-induced engagement and vocabulary acquisition in adults. The purpose of developing this research is to investigate whether word learning can be enhanced by a significant level of task-induced workload, considering metacognitive knowledge and regulatory abilities. For example, the research sample comprised 77 undergraduates who were enrolled in the English major programme (Teng, 2017). The demographic composition consists of 18 males and 59 females, with a mean age of 19 years. Students who participated in the reading intervention had undergone two rounds of assessment to evaluate their vocabulary knowledge: the first time, to determine their prior knowledge, and the second time, to determine if they had made any progress in acquiring new words. Students who demonstrated a greater comprehension of the cognitive process and regulation of cognition achieved greater success in word learning, suggesting that metacognition serves as an indicator of higher educational performance (Teng, 2017).

In another study, critical thinking skills were taught using adult distance learning (ADL; Dwyer & Walsh, 2020). ADL refers to learning that involves an educational modality wherein employed adults who have lapsed since their initial education, re-engage in formal learning to finish their Training and Education Bachelor of Arts degree entirely via e-learning. Empirical research indicates that students who participate in e-learning demonstrate enhanced problem-solving and decision-making abilities, which are fundamental building blocks of critical thinking, in comparison to those who adhere to the conventional learning model of attending physical classes on a regular basis (Dwyer & Walsh, 2020). As a result, ADL students assumed greater accountability for their own conduct and developed a greater sense of agency. In turn, it encourages these students to persevere in their academic pursuits, which could foster enhanced critical thinking. Furthermore, critical thinking requires autonomy of thought processes and comprehension of these processes. The e-learning environment thus offers necessary opportunities to demonstrate independence and the cognitive control required to boost critical thinking (Dwyer & Walsh, 2020; Waring, 2024).

A recent study by Brinkhof et al. (2023) investigated whether a metacognitive self-help intervention could efficiently promote resilience by enhancing behavioural adaptability in the elderly, including those without mild mental health issues. Especially for the elderly, the capacity to exhibit resilience is an effective adjustment during adversity that is frequently associated with successful ageing. By assisting them in establishing plans and goals that are realistic and attainable, developing a heightened awareness of their thoughts, emotions, and actions, and recognising obstacles that impede the attainment of those objectives, this metacognitive self-help intervention is a creative technique for motivating senior adults. It provides a novel and promising approach to promoting behavioural adaptability, a crucial component of resilience in old age, by facilitating the maintenance of autonomy and independent functioning. The aforementioned literature highlighted the importance of metacognitive intervention in enhancing educational performance, critical thinking, adaptability, and resilience. Nevertheless, there is no empirical study that investigates an online metacognitive intervention to promote adaptability and career resilience over eight weeks.

Purpose of the study

The present research aims to investigate the effectiveness of the eight-week online metacognitive intervention on young and mature employees.

(1) What are the differences in the scores of learning agility, social adaptability and career resilience between young (21 – 30 years) and mature employees (50 years and above)?

(2) What is the efficacy of metacognitive intervention on individual learning agility, social adaptability, and career resilience?

The hypotheses are:

(1) There will be differences in the scores of learning agility, social adaptability, and career resilience between young and mature employees.

(2) There will be significant changes in the scores of learning agility, social adaptability, and career resilience after the metacognitive intervention.

Method

Participants and procedure

Prior to data collection, ethical clearance was granted from the university's Institutional Research Board (IRB-2022-883). The present study recruited participants by using Telegram, a cloud-based mobile and desktop messaging application. A total of 79 participants (40 males, 39 females) were recruited for the study, over three waves of data collection. Written consent and confidentiality of all participants were assured. There were 21 participants in the first wave of data collection, 26 participants in the second wave, and 32 participants in the third wave. Due to the dropout of some participants, the final sample size comprised 71 participants (37 males, 34 females). Upon completing the 8-week intervention, each participant received an evaluation report on their pre- and post-questionnaire scores for self-perceived metacognitive

skills and other competencies.

Online metacognitive intervention

The online metacognitive workshop took place over four sessions, with a total of eight hours. The four two-hour online sessions were conducted over eight weeks and are described in detail in Table 1. The two-week period between each session is to allow participants to practise what they have learnt in each session and apply the strategies at work for the subsequent weeks. The rationale for an eight-week online intervention is that cognitive training is more effective when the duration is longer than seven weeks, with less frequency of training (Oh et al., 2018; Toril et al., 2014). Cognitive training that spans over one to six weeks is considered a short duration. A total of eight weeks of online metacognitive intervention was then used for this training.

Table 1. Details of online metacognitive intervention.

Week	Session	Description	Tasks
1	1	Pre-questionnaire of perceived metacognitive skills and competencies	Completion of pre-questionnaire
		Metacognition, planning, and goal setting (lectures, short videos)	Handout activity based on individual participant's work-related goals and reflection
3	2	Decision-making skills (lectures, short videos)	Handout activity based on decision-making case studies and reflection
5	3	Self-regulated learning and monitoring (lectures, short videos)	Handout activity based on Thinking Aloud strategies to provide rationale for each step of their work task and reflection
7	4	Evaluating and self-reflection (lectures, short videos)	KWL (What I Know, What I Want to Know, What I Learnt) Chart and reflection
		Post-questionnaire of perceived metacognitive skills and competencies	Completion of post-questionnaire

Outcome measures

The pre-and post-questionnaires contained all the following self-report measures. A 5-point Likert scale format, ranging from 1 (strongly disagree) to 5 (strongly agree), was used for all measures.

Metacognitive awareness inventory

The 20-item Metacognitive Awareness Inventory (MAI) was used to measure self-perceived metacognitive skill competencies (Harrison & Vallin, 2018). The competencies are planning, monitoring and evaluating. Examples of the items were "I think about what I really need to learn before I begin a task" for Planning, "I ask myself if I am meeting my goals from time to time" for Monitoring, and "I ask myself how well I have completed my goals" for Evaluating. Participants responded to the questionnaire in accordance with the degree to which they agreed with each item.

Learning agility scale

The 14-item learning agility scale (LAS) was adapted to measure self-perceived learning agility competencies (Bedford, 2011; SkillsFuture Singapore, 2019). Examples of the items were "I am flexible and adjust my approach when something doesn't work" and "I collect information to monitor implementation of ideas, improvements or new solutions". Participants responded to the questionnaire in accordance with the degree to which they agreed with each item.

Social adaptability and career resilience scale

The 34-item social adaptability and career resilience scale (SACRS) was adapted to measure self-perceived social adaptability and career resilience skills (Khampirat, 2020; Kim, 2021; Ng et al., 2022; SkillsFuture Singapore, 2019), which consisted of two key constructs with seven sub-scales. The two key constructs are social adaptability and career resilience. The sub-scales of social adaptability include socially responsible (e.g., "I solve problems with my peers"), adaptability (e.g., "I monitor own work performance to enhance responses to changes"), and creative thinking (e.g., "I review current work processes and identify potential improvement areas"). The sub-scales of career resilience include coping with career crisis (e.g., "I solve career problems head-on without avoiding them"), coping with career stress (e.g., "I seek solutions to overcome career stress situations"), adjusting career goals (e.g., "I enjoy taking various perspectives while solving a career problem"), and career resilience (e.g., "I do not get discouraged easily after a career failure"). Participants responded to the questionnaire in accordance with the degree to which they agreed with each item.

Data analysis

Questionnaire data were uploaded to a statistical package for analysis. Descriptive statistics and Pearson correlations were conducted. Preliminary analyses were performed to examine any gender differences between the two groups. Repeated measures analyses were conducted to examine the effectiveness of intervention, in terms of changes in their perspectives (i.e., pre- and post-questionnaire scores of the outcome measures). Subsequently, multivariate analyses were performed to evaluate the relationships among learning agility, social adaptability, and career resilience among young and mature employees.

Results

The present study explored an online metacognitive intervention to develop young and mature employees' metacognitive skills, learning agility, social adaptability and career resilience. Descriptive statistics showed the mean scores for all variables. The mean of all variables is greater in post-intervention than in pre-intervention. The effect size of each variable is also presented. The effect size estimates of 0.10, 0.25 and 0.50 indicate small, medium and large, respectively (Richardson 2011). Table 2 presents the descriptive statistics and within-group effects of each variable.

Table 2. Descriptive statistics and effects table.

	Pre-Intervention		Post-Intervention		Effect	
Variable	Mean	SD	Mean	SD	F	η_p^2
Planning	3.76	0.52	3.95	0.45	12.048**	0.147
Monitoring	3.83	0.53	3.93	0.50	2.799	0.038
Evaluating	3.83	0.54	3.88	0.57	0.539	0.008
Learning agility	4.01	0.38	4.08	0.49	2.363	0.033
Socially responsible	4.01	0.54	4.12	0.51	2.879	0.040
Adaptability	3.93	0.50	4.08	0.57	10.307*	0.128
Creative thinking	3.90	0.55	4.07	0.63	8.178*	0.105
Coping with career crisis	3.64	0.70	3.80	0.69	7.200*	0.093
Coping with career stress	3.68	0.64	3.90	0.66	11.472**	0.141
Adjusting career goals	3.88	0.57	4.09	0.57	12.086**	0.147
Career resilience	3.61	0.70	3.88	0.74	13.630**	0.163

$p < 0.01^{*}$; $p < 0.001^{**}$

The reliability coefficients for the pre-intervention variables are very satisfactory. The Cronbach alpha for planning is 0.77; monitoring is 0.79; evaluating is 0.76; learning agility is 0.85; coping with career crisis is 0.87; coping with career stress is 0.78; adjusting career goals is 0.81; socially responsible is 0.82; resilience is 0.84; adaptability is 0.85, creative thinking is 0.82. Table 3 presents the Pearson correlations and Cronbach alpha of pre-intervention variables. Similarly, the reliability coefficients of the post-intervention measures are satisfactory. The Cronbach alpha for planning is 0.65; monitoring is 0.78; evaluating is 0.74; learning agility is 0.92; coping with career crisis is 0.88; coping with career stress is 0.83; adjusting career goals is 0.84; socially responsible is 0.80; resilience is 0.90; adaptability is 0.89; and creative thinking is 0.91. Correlational results showed positive significant relationships among all eleven variables both for pre-intervention and post-intervention. For example, among pre-intervention variables, planning and monitoring have the strongest positive correlation (r = 0.760, $p < .001$). Among post-intervention variables, learning agility and adaptability have the strongest positive correlation (r = 0.852, $p < 0.001$). Table 4 presents the Pearson correlations and Cronbach alpha of post-intervention variables.

Table 3. Correlations and Cronbach alpha of pre-intervention variables

Variables	α	1	2	3	4	5	6	7	8	9	10
1. Planning	0.77										
2. Monitoring	0.79	0.760**									
3. Evaluating	0.76	0.673**	0.592**								
4. Learning agility	0.85	0.562**	0.623**	0.670**							
5. Socially responsible	0.82	0.585**	0.502**	0.555**	0.581**						
6. Adaptability	0.85	0.559**	0.508**	0.492**	0.602**	0.665**					
7. Creative thinking	0.82	0.450**	0.543**	0.483**	0.590**	0.456**	0.737**				
8. Coping with career crisis	0.87	0.621**	0.622**	0.473**	0.632**	0.568**	0.724**	0.640**			
9. Coping with career stress	0.78	0.465**	0.523**	0.377**	0.462**	0.549**	0.664**	0.538**	0.684**		
10. Adjusting career goals	0.81	0.502**	0.502**	0.564**	0.520**	0.532**	0.764**	0.729**	0.652**	0.670**	
11. Career resilience	0.84	0.482**	0.531**	0.455**	0.469**	0.490**	0.563**	0.500**	0.736**	0.715**	0.649**

Note: $p < 0.001^{**}$.

Repeated measures analysis with gender and age group as covariates were performed for planning, monitoring, evaluating, learning agility, social adaptability, and career resilience skills variables. It was hypothesised that there would be differences in the scores of learning agility, social adaptability, and career resilience skills between the young and mature groups. The results revealed no significant differences between the two groups in terms of age (Wilk's $\Lambda = 0.875$, $F(11, 58) = 0.752$, $p = 0.685$) and gender (Wilk's $\Lambda = 0.792$, $F(11, 58) = 1.385$, $p = 0.205$). Effect size analyses for partial eta-squared value (ηp^2) also indicated no significant differences in age ($\eta p^2 = 0.125$) and gender ($\eta p^2 = 0.208$).

Table 4. Correlations and Cronbach alpha of post-intervention variables.

Variables	α	1	2	3	4	5	6	7	8	9	10
1. Planning	0.65										
2. Monitoring	0.78	0.721**									
3. Evaluating	0.74	0.765**	0.788**								
4. Learning agility	0.92	0.585**	0.632**	0.811**							
5. Socially responsible	0.80	0.495**	0.566**	0.761**	0.839**						
6. Adaptability	0.89	0.651**	0.664**	0.771**	0.852**	0.821**					
7. Creative thinking	0.91	0.639**	0.641**	0.764**	0.809**	0.767**	0.902**				
8. Coping with career crisis	0.88	0.616**	0.549**	0.701**	0.730**	0.700**	0.739**	0.730**			
9. Coping with career stress	0.83	0.569**	0.500**	0.694**	0.791**	0.707**	0.797**	0.784**	0.807**		
10. Adjusting career goals	0.84	0.528**	0.560**	0.680**	0.749**	0.755**	0.761**	0.711**	0.706**	0.736**	
11. Career resilience	0.90	0.587**	0.469**	0.689**	0.760**	0.708**	0.828**	0.802**	0.801**	0.833**	0.688**

Note: $p < 0.001^{**}$.

One-way repeated-measures ANOVA was conducted to determine whether there were significant changes in planning, monitoring, evaluating, learning agility, social adaptability, and career resilience skills (SACRS) over time (see Table 2). The results revealed significant within-group effect (Wilk's $\Lambda = 0.662$, $F(11, 60) = 2.786$, $p = 0.005$) and the effect size is medium ($\eta p^2 = 0.338$). It was hypothesised that learning agility, social adaptability, and career resilience skills would have significant changes from pre- to post-intervention. Subsequent univariate tests showed significant within-group effects for planning ($F(1, 71) = 12.048$, $p < 0.001$); adaptability ($F(1, 71) = 10.307$, p = 0.002); creative thinking ($F(1,71) = 8.178$, $p = 0.006$); coping with career crisis (F(1, 71) = 7.200, $p = 0.009$); coping with career stress ($F(1, 71) = 11.472$, $p = 0.001$); adjusting career goals ($F(1,71) = 12.086$, $p < 0.001$); and resilience ($F(1, 71) = 13.630$, $p < 0.001$). Effect size analyses also indicated significant change between pre- and post-intervention scores of each variable: planning ($\eta p^2 = 0.147$); adaptability (ηp2 = 0.128); creative thinking ($\eta p^2 = 0.105$); coping with career crisis ($\eta p^2 = 0.093$); coping with career stress ($\eta p^2 = 0.141$); adjusting career goals ($\eta p^2 = 0.147$); and resilience ($\eta p^2 = 0.163$).

However, there was insignificant within-group effect for monitoring ($F(1, 71) = 2.799$, $p = 0.099$); evaluating ($F(1, 71) = 0.539$, p = 0.465); learning agility (F(1, 71) = 2.363, $p = 0.129$); and socially responsible ($F(1, 71) = 2.879$, $p = 0.094$). Effect size analyses also indicated no significant change between pre- and post-intervention scores of each variable: monitoring ($\eta p^2 = 0.038$); evaluating ($\eta p^2 = 0.008$); learning agility (ηp2 = 0.033); and socially responsible ($\eta p^2 = 0.040$). Overall, all variables increased from pre- to post-intervention, except for monitoring, evaluating, learning agility, and socially responsible.

Discussion

The purpose of the present study was to explore an online metacognitive intervention on young and mature working adults' adaptability and career resilience. It examined whether the intervention would encourage the utilisation of metacognitive strategies at the workplace and if there were any significant changes between the pre- and post-

intervention scores of all variables. For the first hypothesis, the metacognitive intervention showed no significant difference between the two groups (i.e., young and mature) of working adults, suggesting that metacognitive strategies are equally important in both groups. The subsequent univariate findings showed significant changes in the planning score, indicating that participants had improved planning skills after the metacognitive intervention. However, the increased scores for monitoring and evaluating are not significant. As for the second hypothesis, there were significant changes in the scores of adaptability, creative thinking and career resilience, but not learning agility.

Correlational results for all pre- and post-intervention scores are significant, indicating significant relationships among all 11 variables. The strongest relationship between learning agility and adaptability was demonstrated for the post-intervention scores. This finding is consistent with a recent conceptual paper that postulated that learning agility can increase an employee's adaptability (Lee & Song, 2022). When employees are faced with unfamiliar working conditions, they can adapt and perform effectively in changing job environments as they learn from experience with agility.

The efficacy of the metacognitive intervention was indicated by the significant increase in the scores for planning, adaptability, creative thinking, and career resilience. There are also significant increases in the career-related variables namely, coping with career crisis, coping with career stress and adjusting career goals, suggesting the positive efficacy of the metacognitive strategies. Applying metacognitive strategies at work is likely to enable individuals to align their career goals, manage the stress at work and stay resilient. As supported by a recent paper, the metacognitive approach is sustainable as it shapes an individual's physiological, behavioural and psychological response to stress by having a heightened awareness of their thinking process (Crum et al., 2023). Based on the effect sizes, it is significant that metacognitive strategies supported the improved scores on the individuals' adaptability, creative thinking, career resilience, and career-related variables.

First, metacognitive intervention has significant effects on the social adaptability variables namely adaptability and creative thinking, but not learning agility. This is an interesting finding, as the correlational results showed a very strong relationship between learning agility and adaptability. One possible explanation is that learning agility takes time to develop and the eight-week metacognitive intervention might not reveal the positive result. As stated by Lee and Song (2022), learning agility is defined as the ability to learn from experience. It takes time for individuals to learn from experience and develop the competency of learning agility. For instance, the amount of working experience accumulated over time and the skills developed over the lifespan of working are likely to promote learning agility. Furthermore, it is also dependent on the individual participants whether their working environment requires them to be agile learners when at work. It is likely that the working conditions might be routine, and they might not have the opportunity to develop and apply their learning agility skill.

Second, creative thinking is considered important in organisational research, especially in problem-solving, idea generation and idea evaluation (Pinkow, 2023). Amabile and Pratt (2016) stated that motivational factors are essential antecedents to creative thinking. Motivation drives individuals to learn and their ability to be involved in the co-creation of knowledge that is related to creative thinking (Gono & de Moraes, 2023). Hence, motivation stimulates engagement in creative thinking, and this is related to adaptability and career resilience.

Finally, the metacognitive intervention significantly affects career resilience variables, namely coping with career crisis, coping with career stress, adjusting career goals, and career resilience. This is an important finding as career resilience is an important construct in developing and achieving career goals and overcoming acute or chronic adversities during their years of working. Career resilience is about adjusting one's career goals in response to changes due to the organisational structure and strategy or evolving working environments (Coetzee et al., 2023). Aligned with the current correlational results, career resilience is also strongly associated with coping with career crisis and stress. Results in this study thereby suggest that using a metacognitive intervention supported young and mature employees' adaptability, creative thinking and career resilience.

Practical implications and limitations

The present study highlighted the importance of metacognitive strategies in the workplace by facilitating young and mature working adults' adaptability and career resilience. In today's evolving climate, equipping individuals with relevant skills could mitigate the impact of potential job losses and enhance lifelong employability among young and mature employees. Besides career resilience, it is necessary for individuals to build relationships and expand their knowledge for personal and professional growth (Pylväs et al., 2022). In particularly, knowledge workers are considered mobile in today's context. As such, social adaptability is crucial for individuals to adjust their needs and perform their best at work (Kucharska & Kucharski, 2023).

The current findings offer two practical implications. First, the notion of utilising metacognitive skills is increasingly important with the changing nature of work. Metacognitive skills are linked to motivation and lifelong learning, which in turn results in career resilience and success (Ng et al., 2022). Second, the massive technological globalisation demands metacognitive strategies to learn and use generative artificial intelligence tools and big data analytics in today's world (Ng, 2022; Waring, 2024). Metacognitive skills are also important for individuals to regulate their cognition and control their decisions while at work. As such, it is essential to develop employees' metacognitive skills and enhance their adaptability and creative thinking skills which are strongly related to career resilience.

Although the hypotheses of the study were achieved, there are still some limitations to the study. The limitations are that this study did not have a control group to evaluate the impact of the metacognitive intervention and it did not

have a large sample size. As this is a preliminary study to test out the metacognitive intervention, future research will include the control group and a larger sample size for generalisation of the findings. In addition, there might be a lack of psychometric properties of the instrument that comprised the combined use of scales. As the current sample size was small, the confirmatory factor analysis was not performed. Finally, another limitation is that the activities for metacognitive intervention conformed to individual effort, with no social, collaborative involvement, resulting in no significant change in socially responsible scores. The contents of this metacognitive workshop could be improved for future intervention research.

Conclusion

This paper explored an online metacognitive intervention on young and mature employees' use of strategies that can inform policy and practice. The intent of this study is to contribute to both higher education and workplace learning by empowering our employees with metacognitive strategies. For instance, higher education institutes could consider applying metacognitive strategies to their training programmes (e.g., pre-employment training, continuing education and training) to support our working adults' employment and employability. Although this is a preliminary study, findings suggest that this online metacognitive workshop may be a promising intervention for increasing individuals' metacognitive skills. Future research should continue to examine metacognitive strategies in organisational and workplace research.

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References

Abdulshah, M., Hakaki, A., Zarei, A. A., Mohammadnia, M., & Saberian, H. (2017). The impact of extraversion on employee loyalty with mediating role of social and career adaptability in Saveh chocolate factory Mfg. Co. (PJS). *IAU International Journal of Social Sciences, 7*(2), 35-51. https://www.researchgate.net/publication/322078352_The_Impact_of_Extraversion_on_Employee_Loyalty_with_Mediating_Role_of_Social_and_Career_Adaptability_in_Saveh_Chocolate_Factory_Mfg_Co_PJS

Ahmad, B., Latif, S., Bilal, A. R., & Hai, M. (2019). The mediating role of career resilience on the relationship between career competency and career success. *Asia-Pacific Journal of Business Administration, 11*(3), 209-231. http://dx.doi.org/10.1108/APJBA-04-2019-0079

Amabile, T. M., & Pratt, M. G. (2016). The dynamic componential model of creativity and innovation in organisations: Making progress, making meaning. *Research in Organisational Behaviour, 36*, 157–183. https:// doi.org/10.1016/j.riob.2016.10.001

Baron, R. A., & Markman, G. D. (2003). Beyond social capital: The role of entrepreneurs' social competence in their financial success. *Journal of Business Venturing, 18*, 41-60. https://doi.org/10.1016/S0883-9026(00)00069-0

Baron, R. A., & Tang, J. (2009). Entrepreneurs' social skills and new venture performance: Mediating mechanisms and cultural generality. *Journal of Management, 35*(2), 282-306. https://doi.org/10.1177/0149206307312513

Bedford, C. L. (2011). *The role of learning agility in workplace performance and career advancement.* University of Minnesota.

Bell, B. S. (2017). *Strategies for supporting self-regulation during self-directed learning in the workplace*. Cornell University, ILR School. https://digitalcommons.ilr.cornell.edu/articles/1295

Brinkhof, L. P., Ridderinkhof, K R., Bieleke, M., Murre, J. M. J., & de Wit, S. (2023). Are older individuals predisposed to habitual control more resilient? *Current Psychology, 43* (2024), 7826–7842. https://doi.org/10.1007/s12144-023-04982-7

Chung, C., & Chapman, E. (2023). Intent to transfer learning amongst adult learners with differential learning orientations. *Journal of Applied Learning and Teaching, 6*(1), 136-150. https://doi.org/10.37074/jalt.2023.6.1.3

Coetzee, M., Mbiko, H. N., & Nel, E. (2023). To what extent do career agility and psychological capital activate employees' career adaptability and foster their career resilience and career satisfaction?. *South African Journal of Psychology, 53*(3), 438-451. https://doi.org/10.1177/00812463231186271

Crum, A. J., Santoro, E., Handley-Miner, I., Smith, E. N., Evans, K., Moraveji, N., ... & Salovey, P. (2023). Evaluation of the "rethink stress" mindset intervention: A metacognitive approach to changing mindsets. *Journal of Experimental Psychology, 152*(9), 2603-2622. https://doi.org/10.1037/xge0001396

DeRue, D. S., Ashford, S. J., & Myers, C. G. (2012). Learning agility: In search of conceptual clarity and theoretical grounding. *Industrial and Organisational Psychology, 5*(3), 258-279. https://doi.org/10.1111/j.1754-9434.2012.01444.x

Drigas, A., Mitsea, E., & Skianis, C. (2023). Meta-learning: A nine-layer model based on metacognition and smart technologies. Sustainability, 15(2), 1668. https://doi.org/10.3390/su15021668

Dwyer, C. P., & Walsh, A. (2020). An exploratory quantitative case study of critical thinking development through adult distance learning. *Educational Technology Research and Development, 68*(1), 17-35. https://doi.org/10.1007/s11423-019-09659-2

Flavell, J. H. (1979). Metacognition and cognitive monitoring: A new area of cognitive-developmental inquiry.

American Psychologist, 34(10), 906-911. http://dx.doi.org/10.1037/0003-066X.34.10.906

Gono, S., & de Moraes, A. J. (2023). Student appraisals of collaborative team teaching: A quest for student engagement. *Journal of Applied Learning and Teaching, 6*(1), 222-233. http://dx.doi.org/10.37074/jalt.2023.6.1.26

Gube, M., & Lajoie, S. (2020). Adaptive expertise and creative thinking: A synthetic review and implications for practice. *Thinking Skills and Creativity, 35,* 100630. https://doi.org/10.1016/j.tsc.2020.100630

Hargrove, R. A., & Nietfeld, J. L. (2015). The impact of metacognitive instruction on creative problem-solving. *The Journal of Experimental Education, 83*(3), 291-318. http://dx.doi.org/10.1080/00220973.2013.876604

Harrison, G. M., & Vallin, L. M. (2018). Evaluating the metacognitive awareness inventory using empirical factor-structure evidence. *Metacognition and Learning, 13,* 15-38. https://doi.org/10.1007/s11409-017-9176-z

Khampirat, B. (2020). The relationship between paternal education, self-esteem, resilience, future orientation, and career aspirations. *Plos One, 15*(12), e0243283. https://doi.org/10.1371/journal.pone.0243283

Kim, J. (2021). Development and validation of the career adaptability scale for undergraduates in Korea. *Sustainability, 13*(19), 11004. https://doi.org/10.3390/su131911004

Kucharska, W., & Kucharski, M. (2023, November). Technological vs. non-technological mindsets: Learning from mistakes, and organisational change. Adaptability to remote work. In *18th European Conference on Management, Leadership and Governance*. Academic Conferences and Publishing Limited.

Le, A. H., Billett, S., Choy, S., & Dymock, D. (2023). Supporting work life learning at work to sustain employability. *International Journal of Training and Development, 27*(1), 135-155. https://doi.org/10.1111/ijtd.12288

Lee, J., & Song, J. H. (2022). Developing a conceptual integrated model for the employee's learning agility. *Performance Improvement Quarterly, 34*(4), 367-394. http://dx.doi.org/10.1002/piq.21352

Metcalfe, J., & Shimamura, A. P. (Eds.). (1994). *Metacognition: Knowing about knowing*. MIT Press.

Ng, B. (Ed.). (2022). *Higher education and job employability.* Springer.

Ng, B., & Kong, L. C. (2022). Graduate resilience in future workplace: Mindfulness-based research on personality traits, trait affect and resilience. In B. Ng (Ed,), *Higher education and job employability* (pp. 255-285). Cham: Springer International Publishing.

Ng, B., Lee, A. N., & Chua, B. L. (2022). Preparing graduates for future workplace: Development and validation of Work Readiness Assessment Inventory (WRAI). In B. Ng (Ed.), *Higher education and job employability* (pp. 13-35). Cham: Springer International Publishing.

Oh, S. J., Seo, S., Lee, J. H., Song, M. J., & Shin, M. S. (2018). Effects of smartphone-based memory training for older adults with subjective memory complaints: A randomised controlled trial. *Aging & Mental Health, 22*(4), 526-534. https://doi.org/10.1080/13607863.2016.1274373

Organisation for Economic Co-operation and Development. (2022). *OECD skills outlook 2022: Skills for the digital transition*. OECD Publishing. https://doi.org/10.1787/ea0a0fe1-en

Pinkow, F. (2023). Creative cognition: A multidisciplinary and integrative framework of creative thinking. *Creativity and Innovation Management, 32*(3), 472-492. https://doi.org/10.1111/caim.12541

Pipe, T. B., Buchda, V. L., Launder, S., Hudak, B., Hulvey, L., Karns, K. E., & Pendergast, D. (2012). Building personal and professional resources of resilience and agility in the healthcare workplace. *Stress and Health, 28*(1), 11-22. https://doi.org/10.1002/smi.1396

Pylväs, L., Li, J., & Nokelainen, P. (2022). Professional growth and workplace learning. In B. Ng (Ed.), *Research approaches on workplace learning: Insights from a growing field* (pp. 137-155). Cham: Springer International Publishing.

Richardson, J. T. (2011). Eta squared and partial eta squared as measures of effect size in educational research. *Educational Research Review, 6*(2), 135-147. https://doi.org/10.1016/j.edurev.2010.12.001

Schmidt, A. M., & Ford, J. K. (2003). Learning within a learner control training environment: The interactive effects of goal orientation and metacognitive instruction on learning outcomes. *Personnel Psychology, 56*(2), 405-429. https://doi.org/10.5709/acp-0202-9

SkillsFutureSingapore. (2019). *Critical core skills.* https://www.skillsfuture.gov.sg/skillsframework/criticalcoreskills

Skulmowski, A., & Rey, G. D. (2017). Bodily effort enhances learning and metacognition: Investigating the relation between physical effort and cognition using dual-process models of embodiment. *Advances in Cognitive Psychology, 13*(1), 3. https://doi.org/10.5709/acp-0202-9

Teng, F. (2017). The effects of task-induced involvement load on word learning and confidence judgments mediated by knowledge and regulation of cognition. *Educational Sciences: Theory & Practice, 17*, 791-808. http://dx.doi.org/10.12738/estp.2017.3.0167

Tien, H. L. S., & Wang, Y. C. (2017). Career adaptability, employability, and career resilience of Asian people. In K. Maree (Ed.), *Psychology of career adaptability, employability and resilience* (pp. 299-314). Springer, Cham.

Toril, P., Reales, J. M., & Ballesteros, S. (2014). Video game training enhances cognition of older adults: A meta-analytic study. *Psychology and Aging, 29*(3), 706-716. http://dx.doi.org/10.1037/a0037507

Waring, P. (2024). Artificial intelligence and graduate employability: What should we teach Generation AI?. *Journal of Applied Learning and Teaching, 7*(1), 22-25. https://doi.org/10.37074/jalt.2024.7.1.42