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Trait, state, and task-contingent conscientiousness: Influence on learning and transfer☆

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ABSTRACT

Personality psychology has primarily been concerned with personality traits, but the emphasis on traits ignores momentary expression of personality traits in a given situation and individuals' dynamic contingent response to situations. Integrating trait, process, and contingent approaches to personality, we examined the roles of trait, state, and task-contingent conscientiousness in learning and transfer. Personality and test data were collected from 109 individuals who participated in a learner-controlled computer-based training program. As hypothesized, trait conscientiousness predicted state conscientiousness during training, which in turn predicted self-regulatory processes and learning outcomes. Meanwhile, task-contingent conscientiousness did not predict state conscientiousness during training, when the learning task was relatively easy. More importantly, task-contingent conscientiousness exerted a direct effect on transfer, when task demands became exceedingly difficult and dynamic. The present findings not only provide input for training design and intervention, but also highlight the potential of further investigating contingent units of personality.

1. Introduction

Trainee personality is an important antecedent to learning and subsequent transfer of learning (Baldwin & Ford, 1988; Blume, Ford, Baldwin, & Huang, 2010). The existing literature on trainee personality has focused on personality traits, i.e., the consistent pattern of behavior an individual tends to display across various situations (Tellegen, 1991). However, behavior can be situational specific, rendering global personality traits suboptimal predictors of specific behaviors (Mischel, 1968). The study of trainee personality may benefit from considering dynamic personality constructs, including personality states (i.e., momentary states classified in personality terms; Fleeson, 2001) and situation-contingent personality (i.e., typical response to a certain situational characteristic, classified in personality terms; Fleeson, 2007). Focusing on conscientiousness as a relevant personality domain, we integrate state conscientiousness and task-contingent conscientiousness (Huang & Ryan, 2011; Minbashian, Wood, & Beckmann, 2010) in the training context.

This paper makes three contributions to the literature. First, unlike past studies that examined within-person variability of personality states using experience sampling methodology (e.g., Fleeson, 2001), we model state conscientiousness as a between-person process variable in the learning context. Specifically, we identify state conscientiousness during training as a proximal manifestation of trait conscientiousness that influences trainees' self-regulation and subsequent performance.

Second, we propose the direct influence of task-contingent conscientiousness on transfer performance on a dynamic, challenging task, thus extending Minbashian et al.'s (2010) pioneering work that focused on adaptive performance as the outcome. Our study not only broadens the criterion space for task-contingent conscientiousness, but also points to situational contingencies (Fleeson, 2007) as a venue for personality research.

Third, from a methodological perspective, we investigate the feasibility of assessing task-contingent conscientiousness using a self-report measure, thereby moving beyond past effort to examine the contingency between task demand and state conscientiousness through repeated sampling of events (Huang & Ryan, 2011; Minbashian et al., 2010). Although still in need of further validation, our approach can both reduce participant burden in responding and

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the intensity of data collection, thus providing a convenient tool for personality psychologists to assess this relatively new construct.

1.1. Conscientiousness, training, and transfer

Trait conscientiousness captures individuals' tendency to be dependable, organized, hardworking, and achievement-striving across various situations (Digman, 1990; Goldberg, 1992). Several reviews (e.g. Blume et al., 2010, Wilson, Huang, & Kraiger, 2013) have identified trait conscientiousness as a distal predictor to learning and subsequent transfer. However, the trait approach's emphasis on individuals' typical behavioral tendencies ignores situational variations in behavior (Mischel, 1968). In particular, individuals differ on how they respond to specific situational cues — the "if (situation) then (behavior)" within-person behavioral signatures (Mischel & Shoda, 1995).

Recent advances on such dynamic aspects of conscientiousness provide promising venues for training researchers to consider. Fleeson (2001) conceptualized a personality trait as a frequency distribution of personality states on the same domain. Instead of assessing global, general behavioral tendencies, he measured individuals' momentary states using personality terms. Subsequent research has not only documented significant within-person variation of personality states across situations, but also demonstrated that how an individual's personality states fluctuate with changes in situational cues resembles stable individual difference (Fleeson, 2001, 2007; Huang & Ryan, 2011). Using experience sampling methodology, Minbashian et al. (2010) captured *task-contingent conscientiousness* as the degree to which individuals tend to elevate their state conscientiousness in response to challenging tasks and demonstrated task-contingent conscientiousness as a predictor of adaptive performance.

Answering calls to consider the learner as dynamic beings that actively respond to training and transfer situations (Ford & Oswald, 2003), we involve both state and task-contingent conscientiousness in the study of learning and transfer. Fig. 1 presents our proposed model. We note that constructs and linkages on the right hand side of the model, including the self-regulatory mechanisms (Sitzmann & Ely, 2011), training outcomes (Kraiger, Ford, & Salas, 1993), and transfer (Huang, Blume, Ford, & Baldwin, 2015), have largely been supported (e.g. Bell & Kozlowski, 2008, Ford, Smith, Weissbein, Gully, & Salas, 1998). Thus, we focus our hypotheses on the roles of trait, state, and task-contingent conscientiousness.

First, we expect the distal trait conscientiousness to influence state conscientiousness in the training context. As a stable characteristic of the person, trait conscientiousness captures the person's typical level of conscientious behavior (DeYoung, 2015; Fleeson & Jayawickreme, 2015). Experience sample research has demonstrated a positive linkage between trait conscientiousness and the average of state conscientiousness across various situations (e.g. Fleeson, 2001, Huang & Ryan, 2011). That is, state conscientiousness serves as enactment of trait conscientiousness in individual situations (Fleeson & Jayawickreme, 2015). The training context is characterized by ample opportunities to explore, learn, and rehearse, especially in a learner-controlled environment. Thus, based on the trait activation theory (Tett & Burnett, 2003), the task cues in the training context call for the activation of conscientiousness, allowing dispositionally conscientious trainees to be organized, hardworking, and detailed-oriented *while they are learning*. Meanwhile, the situation is not so strong as to diminish individual difference (see Meyer, Dalal, & Hermida, 2010).

Hypothesis 1. : Trait conscientiousness will positively predict state conscientiousness during learner-controlled training.

Task-contingent conscientiousness, in contrast, may not exert significant impact on state conscientiousness during training. Task-contingent conscientiousness captures an individual's tendency to increase his/her state conscientiousness to deal with exceedingly difficult tasks. A training program designed to facilitate and support learning may not present a high degree of difficulty for trainees to need to elevate their state conscientiousness. Thus, we did not propose a specific hypothesis regarding the effect of task-contingent conscientiousness on state conscientiousness during training.

Next, we propose the role of state conscientiousness as an antecedent to self-regulation during training. Recent research has identified state analogs of trait variables as proximal predictors of learning processes and outcomes; such learning states include state goal orientation (Bell & Kozlowski, 2008) and state attribution (Weissbein, Huang, Ford, & Schmidt, 2011). State conscientiousness represents another key learning state that affects how trainees allocate their cognitive and motivational resources during training. As a result, state conscientiousness during training will positively predict trainees' self-regulatory processes during training, specifically *attention* (i.e., sustaining mental focus during training, Sitzmann & Ely, 2011) and *effort* (i.e., devoting time to learning, Sitzmann & Ely, 2011).

Hypothesis 2. : State conscientiousness will predict (a) attention and (b) effort during learner-controlled training.

Finally, we expect task-contingent conscientiousness to exert a direct effect on transfer in a difficult task environment. We focused on the generalization dimension of transfer (Blume et al., 2010), specifically the degree to which trainees can apply the knowledge and skills acquired from a learning environment to a complex, dynamic performance context. The dynamic coupling between task difficulty/challenge and state conscientiousness captured in task-contingent conscientiousness determines that the "*if* (difficult task), *then* (work harder)" behavioral pattern will be triggered when the situational cue of difficult task is present. As noted, we did not expect task-contingent conscientiousness to affect state conscientiousness during training when the learning task

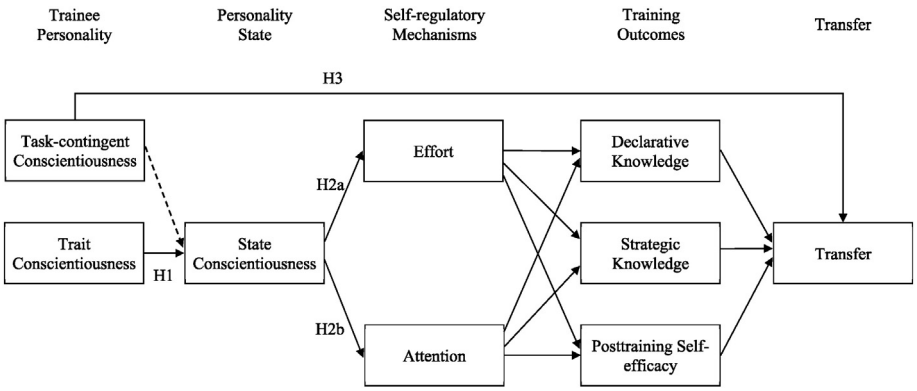

Fig. 1. Proposed research model and specific hypotheses.

is relatively easy. In contrast, after training, trainees dealing with difficult transfer tasks will soon realize the taxing demand on their cognitive and motivational resources. Those with high task-contingent conscientiousness can better cope with the heightened task demand by effectively regulating their state conscientiousness, whereas those with low task-contingent conscientiousness may not adapt as well.

Hypothesis 3. : Task-contingent conscientiousness will predict transfer in a difficult task environment.

We tested the model in a computer-based training program with a dynamic, challenging transfer task. We separated measures over time and utilized several objective measures to mitigate potential concerns for common method bias (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003).

2. Method

2.1. Training program

A self-paced, computer-based training program was used to teach individuals about the game of Mahjong, a four-person tile game where each player attempts to win a hand (i.e., a round of the game) with his/her tiles before any other player does so. The training program, hosted on MediaLab 2008 (Jarvis, 2008), first presented declarative knowledge on the naming of various tiles, the naming of different combinations of tiles, the definition of winning, and the general rules. Multiple video clips were embedded in the training program to provide trainees with information on the progression of the game, examples of actual game play, and strategies on how to succeed.

Each trainee read on a computer screen at his/her own pace about the rules of Mahjong. The training program enabled trainees to customize the pace and sequence of learning, while providing trainees with optional quizzes to assess learning and obtain feedback. Overall, the training program provided trainees with learner control over the pace, content, and feedback on performance (Kraiger & Jerden, 2007).

2.2. Participants and procedure

109 undergraduate students enrolled in introductory psychology courses at a university in the Midwestern U.S. participated in the current study in exchange for extra credit. Participants were on average 20.33 years old ($SD = 2.56$), with 41% males. Participants' ethnic backgrounds varied, with 52% Whites, 22% Blacks, and 9% Asians.

Participants first completed the pretraining survey online that contained trait and task-contingent conscientiousness and demographic information. Upon arrival at the laboratory for the training session, each participant was seated in front of a computer and was informed that the training was self-paced, that they could take as long as they deemed necessary to study the material, and that they had full control of the content, pace, and sequence of the material. Midway through the learning session, participants filled out the state conscientiousness measure. At the end of the training program, participants recalled their attention during training. Participants also filled out a posttraining assessment that included declarative knowledge, strategic knowledge, and posttraining self-efficacy. After that, each participant played a computer Mahjong game against three computer players for 45 minutes with the computer screen recorded. Participants were instructed to obtain as high a score as possible.

2.3. Measures

2.3.1. Trait conscientiousness

We assessed trait conscientiousness with the 10-item ($\alpha = .85$) IPIP-NEO scale (Goldberg et al., 2006). Participants indicated the degree to which each statement accurately described them, using a 7-point scale (1 = very inaccurate; 7 = very accurate). An example item is "pay attention to details."

2.3.2. State conscientiousness

We measured state conscientiousness with ten adjectives ($\alpha = .83$) from Goldberg's (1992) Big Five markers. Participants were asked to reflect on what they felt at the moment (i.e., during training) and to indicate the degree to which each adjective accurately described them, using a 5-point scale (1 = very inaccurate; 5 = very accurate). A sample item is "organized."

2.3.3. Task-contingent conscientiousness

To measure task-contingent conscientiousness, we developed a 6-item scale ($\alpha = .85$) based on Minbashian et al. (2010) and Huang and Ryan (2011). Items were written to reflect individuals' tendency to be more attentive, focused, engaged, and hardworking *when dealing with a more difficult or challenging task* (see Appendix A). Our measurement approach is premised on findings that given a contextual boundary, individuals can meaningfully report their behavioral tendencies (see Roberts, 2007). Participants were instructed to recall their experiences dealing with difficult tasks (relative to simple tasks) and to rate their agreement on each statement using a 7-point scale (1 = strongly disagree and 7 = strongly agree). In a pilot study ($N = 340$), this scale was unidimensional and distinct from trait conscientiousness ($r = .21$).

2.3.4. Attention

Consistent with prevalent practice in the training literature that utilizes self-report measures to assess attention (see Sitzmann & Ely, 2011), we measured attention with seven items ($\alpha = .89$) on a 6-point scale (1 = Strongly Disagree and 6 = Strongly Agree) from Kanfer and Ackerman (1989) and Kanfer, Ackerman, Murtha, Dugdale, and Nelson (1994). A sample item is "I let my mind wander while learning the Mahjong material" (reverse-scored).

2.3.5. Effort

Similar to Fisher and Ford (1998) that considered the amount of time trainees spend on learning the material as indicative of their effort, effort was captured as the amount of time in minutes each trainee spent on learning, objectively recorded by the MediaLab program.

2.3.6. Posttraining self-efficacy

We used five items ($\alpha = .89$) adapted from Ford et al. (1998) to measure the degree to which participants felt confident in following the rules and instructions to play Mahjong. Responses were made on a 5-point scale (1 = Strongly Disagree and 5 = Strongly Agree). An example item is "I am confident in my understanding of the rules of Mahjong."

2.3.7. Declarative knowledge

We used 22 items ($\alpha = .80$, scored on a 100-point scale) to assess declarative knowledge, i.e., whether trainees could recognize or recall facts presented in the training program. Item formats included true-or-false, multiple choice, and free recall.

2.3.8. Strategic knowledge

We presented 10 scenarios to assess trainees' strategic knowledge manifested in objective behavioral outcomes, scored on a 100-point scale. In each scenario, trainees were presented with a combination of tiles and were asked to indicate if a certain action would be desirable. Choosing the correct response options indicated that trainees not only understood the basic rules of the game but also could integrate the rules in actual decision-making.

2.3.9. Transfer

After the posttraining assessment, trainees were instructed to play the game of Mahjong on the computer against three computer players

for 45 minutes. They were told to obtain a score by winning as many hands as possible. Their winning proportions (i.e., number of wins divided by number of hands played) were recorded as their transfer scores. We applied an arcsine square root transformation to stabilize variance (Kutner, Nachtsheim, Neter, & Li, 2004) for the proportion scores.

It should be noted that, compared to the learning environment, the transfer task was highly dynamic and complex, involving the constant application of the declarative (recognizing the tiles) and strategic knowledge (identifying the most appropriate action). Trainees were also under time pressure (Minbashian et al., 2010) to make decisions.

3. Results

We first performed a confirmatory factor analysis (CFA) with MPlus 6.11 (Muthén & Muthén, 2010) to examine the factor structure of the task-contingent conscientiousness scale. A single factor CFA revealed a good fit to the data, $\chi^2 = 12.36$, $df = 9$, $p = .19$; CFI = .99, TLI = .98; RMSEA = .06. All items loaded on the latent factor, with an average standardized loading of .68 (minimum loading .54). The CFA reassured the measurement properties of the task-contingent conscientiousness scale.

Intercorrelations for the study variables (Table 1) revealed that task-contingent conscientiousness was not associated with trait conscientiousness ($r = -.02$, *ns*) or state conscientiousness during training ($r = .07$, *ns*), providing discriminant validity evidence. Moreover, task-contingent conscientiousness ($r = .24$, $p < .05$) was positively associated with transfer performance, supporting the notion that task-contingent conscientiousness is a valuable individual difference variable to consider in performance in dynamic, challenging environments.

We evaluated the research model with structural equation modeling via MPlus, using the two-step process described in Kline (2005). First, we assessed the measurement model. Recognizing various issues in inferring model fit with χ^2 goodness-of-fit statistic (Bentler, 1990), we assessed model fit with CFI, TLI, and RMSEA (Hu & Bentler, 1999). In light of the modest sample size, we created random item parcels (Williams & O'Boyle, 2008) for scales with more than five items. We created single indicator latent factors (Williams & O'Boyle, 2008) for objectively measured effort, strategic knowledge, and transfer performance and assumed their reliability to be unity. The measurement model provided good fit to the data, $\chi^2 = 290.53$, $df = 197$, $p < .001$; CFI = .93, TLI = .91; RMSEA = .07.

Second, we examined the structural model proposed in Fig. 1. The structural model had an acceptable fit to the data, $\chi^2 = 342.27$, $df = 218$, $p < .001$; CFI = .91, TLI = .89; RMSEA = .07. We present standardized path coefficients in Fig. 2. In support of Hypothesis 1, trait conscientiousness positively predicted state conscientiousness during training ($\beta = .28$, $p < .01$). In contrast, task-contingent conscientiousness had a positive yet nonsignificant effect on state conscientiousness ($\beta = .13$, $p = .22$). Thus, trainees with a general tendency to be organized, detail-oriented, and hardworking tended to act in a similar manner during training, although the effect was only moderate in magnitude.

Next, trainees' state conscientiousness served as a proximal predictor to trainee motivational processes. Supporting Hypothesis 2, state conscientiousness positively predicted effort and attention during training (βs = .32 and .26, respectively, ps < .05). Therefore, trainees who behave in a manner that is organized, detailed-oriented, and hardworking during training tend to exert more effort and attention throughout the training, which in turn predicted training outcomes.

The findings also supported the hypothesized positive effect of task-contingent conscientiousness on transfer (Hypothesis 3). As expected, task-contingent conscientiousness had a significant direct effect on performance on the more difficult and challenging transfer task ($\beta = .21$, $p < .05$), controlling for the influence of training outcomes. This positive direct effect suggests that trainees with high task-contingent conscientiousness activated the "*if* (difficult task), *then* (work harder)" behavioral pattern during the difficult transfer phase.

Finally, recognizing the relatively small sample size for the structural equation models, we conducted a simpler path analysis based on observed variables. The path model fitted the data reasonably well, $\chi^2 = 34.55$, $df = 20$, $p = .02$; CFI = .91, TLI = .85; RMSEA = .08, after allowing correlated disturbance terms for declarative and procedural knowledge. The pattern of findings from the path model was no different from the full structural equation model.

4. Discussion

The current study supported the expected effects of trait, state, and task-contingent conscientiousness on learning and transfer. Specifically, trait conscientiousness exerts indirect effect on self-regulatory processes and training outcomes through state conscientiousness, whereas task-contingent conscientiousness directly influenced transfer in a difficult and dynamic task environment. In addition, task-contingent conscientiousness did not significantly predict state conscientiousness during training, indicating the need to take into account situational challenges as cues to activate predictions for task-contingent conscientiousness.

4.1. Research implications and future research

Several limitations of the current study should be noted. First, there was no incentive for trainees in this training study to perform well, as student participants earned extra course credit regardless of effort. This left each participant to determine how much effort he/she would expend in the training. Thus, our study context resembled a weak situation where individual differences in conscientiousness are more likely to affect behaviors. It is conceivable that, in a strong situation characterized by

Table 1
Descriptive statistics and intercorrelations for study variables.

	1	2	3	4	5	6	7	8	9
1. Task-contingent consc.	–								
2. Trait conscientiousness	−.02	–							
3. State conscientiousness	.07	.28	–						
4. Effort	−.01	−.09	.31	–					
5. Attention	.04	.24	.23	.20	–				
6. Declarative knowledge	.17	−.09	.24	.39	.42	–			
7. Strategic knowledge	.03	−.06	.15	.26	.22	.45	–		
8. Posttraining self-efficacy	.12	.12	.09	.08	.53	.37	.27	–	
9. Transfer performance	.24	−.01	.20	.20	.38	.47	.45	.36	–
M	5.45	4.92	4.08	23.47	4.12	60.34	46.06	3.20	0.29
SD	0.81	0.96	0.61	7.07	1.05	17.62	15.99	0.94	0.25

Note. $N = 109$. When $r \geq .19$, $p < .05$; when $r \geq .25$, $p < .01$; when $r > .31$, $p < .001$.
Consc. = conscientiousness.
Transfer performance = $\arcsin\left(\sqrt{\frac{\text{number of wins}}{\text{total number of hands played}}}\right)$.

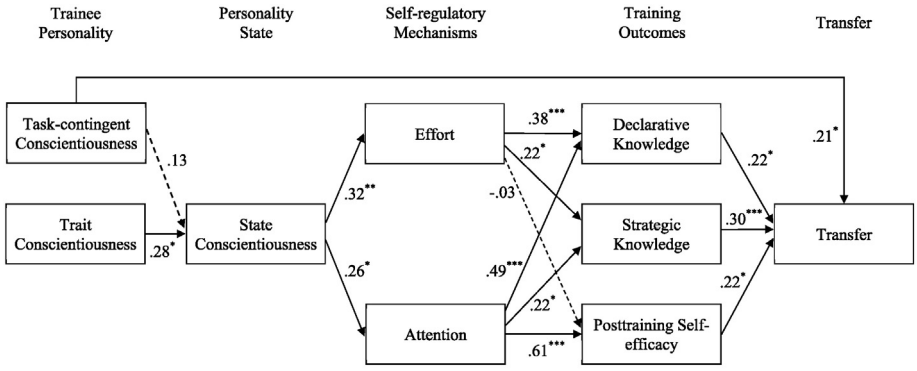

Fig. 2. Structural model with standardized coefficients. *Note.* $N = 109$. $^{*}p < .05$; $^{**}p < .01$; $^{***}p < .001$.

uniformly high motivation, trait and task-contingent conscientiousness may exert weaker influence on learning outcomes and transfer.

Second, the current study utilized a between-person design that assessed the influence of task-contingent conscientiousness on transfer across trainees. It was assumed that the transfer task environment would be perceived as difficult by most trainees, making task-contingent conscientiousness highly relevant. Further experimental validation effort is needed to investigate the degree to which this self-report measure captures the within-person tendency to elevate one's state conscientiousness when encountering heightened task demands. Researchers may utilize a within-person design that presents to each individual tasks with different levels of difficulty. It is also possible that individuals' subjective evaluation of task difficulty may moderate the influence of task-contingent conscientiousness.

Third, the current transfer task represents a maximum transfer situation (Huang et al., 2015), because trainees performed the transfer task in the laboratory environment under explicit instructions to maximize their performance. The relevance of task-contingent conscientiousness will need to be evaluated in a typical transfer context (Huang et al., 2015) where transfer performance occurs for a prolonged period of time without explicit instruction to maximize effort. It is likely that task-contingent conscientiousness plays a bigger role in a typical transfer context, as motivational factors tend to have stronger influence in typical rather than maximum transfer contexts (Huang et al., 2015).

Limitations notwithstanding, our findings highlight a potential point of entry for researchers to enhance training and transfer. Training researchers may start designing interventions to influence state conscientiousness as a way to affect learning and transfer. Indeed, it is conceivable that some instructional approaches such as learner control and advanced organizers may affect and even interact with state conscientiousness to influence learning. Researchers may also involve task-contingent conscientiousness in the needs assessment stage of training design to identify trainees in particular need of assistance and feedback if the learning or transfer task becomes challenging.

The present paper offers additional evidence supporting the study of situation-contingent personality (see Fleeson, 2007). Given the increasing emphasis organizations place on employees' adaptive performance (Huang, Ryan, Zabel, & Palmer, 2014), the current finding that task-contingent conscientiousness predicts individuals' capability to adapt to challenging task demands underscores the potential to utilize task-contingent conscientiousness in employee selection, especially in jobs that require a high degree of adaptability. Aside from task-contingent conscientiousness, other situation-personality contingency (Huang & Ryan, 2011) may be included in the study of learning and transfer in specific and individual behaviors at work in general. For example, conceptualizing the presence of social support as a situational cue, variation on state neuroticism may resemble stable individual difference variable that may enable prediction of behavior.

From a personality theory perspective, identifying situation-contingent personality and the interrelatedness between traits and states enables personality researchers to consider both stable and variable/dynamic aspects of individuals' personality characteristics, thus providing a richer understanding of the dynamic individual within different situational contexts. Further exploration of the dynamic person's interactions with different situational cues can result in greater precision in understanding and predicting workers' ongoing experience.

In conclusion, the current paper contributes to both the personality and training literature. Identifying the mediating role of state conscientiousness in the learning process and the validity of task-contingent conscientiousness in predicting transfer on a dynamic, challenging task, our research paves a critical step towards better integration and utilization of personality states and situation-contingent personality in psychology.

Appendix A. The task-contingent conscientiousness scale

1. When faced with difficult tasks, I tend to work harder on them than on other tasks.
2. When encountering difficult tasks, I tend to approach them more systematically than I approach other tasks.
3. Compared to other tasks, I tend to become more focused when I work on difficult tasks.
4. Typically I become more mentally engaged in difficult tasks than in other tasks.
5. I typically become more attentive when handling difficult tasks than other tasks.
6. I tend to think more actively on difficult tasks than on other tasks.

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