

Introduction

- Effortful Control (EC) and Executive Functions (EFs), both implicated in the self-regulation of behavior and emotion, are typically studied within different sub-disciplines of psychology.
- EC, typically considered a temperament construct, is the ability to inhibit a prepotent response in favor of performing a sub-dominant response and the ability to detect errors¹.
- Based on factor analytic work, EC is typically comprised of attention shifting, activation control, effortful attention, and inhibitory control².
- EFs are higher-order cognitive processes required for organizing and planning behavior³.
- Factor analytic work has identified three inter-related aspects of EF: Attention shifting/cognitive flexibility, inhibition, and monitoring/updating information in working memory³.
- In addition to conceptual similarity, EC and EF have both been linked to the functioning of the Anterior Cingulate Cortex and the Prefrontal Cortex^{4, 5}.
- EFs and EC have also been associated with similar outcomes, such as academic achievement⁶, childhood externalizing behaviors⁷, and internalizing difficulties in adulthood⁸.
- In light of the conceptual similarity between EC and EFs, the current investigation uses SEM to examine the distinction/similarity between these constructs.

Hypotheses

- It was anticipated that EC would be related to the EF of Inhibition and the EF of Monitoring/Updating Information in Working Memory.
- The EF of Inhibition and the EF of Monitoring/Updating Information in Working Memory were expected to be associated with one another.
- Depressive symptoms, Full Scale IQ, and Gender were all expected to be related to EC and EF in the same direction.

Method - Participants

- 188 young adults (67.7% female, 32.3% male)
- Mean age = 19.85 years (range = 18 to 29 years)
- Most participants self-identified as Caucasian (54.3%), African American (28.8%) or Hispanic/Latino (11.4%).
- All participants were enrolled in psychology courses and received course credit for participating.

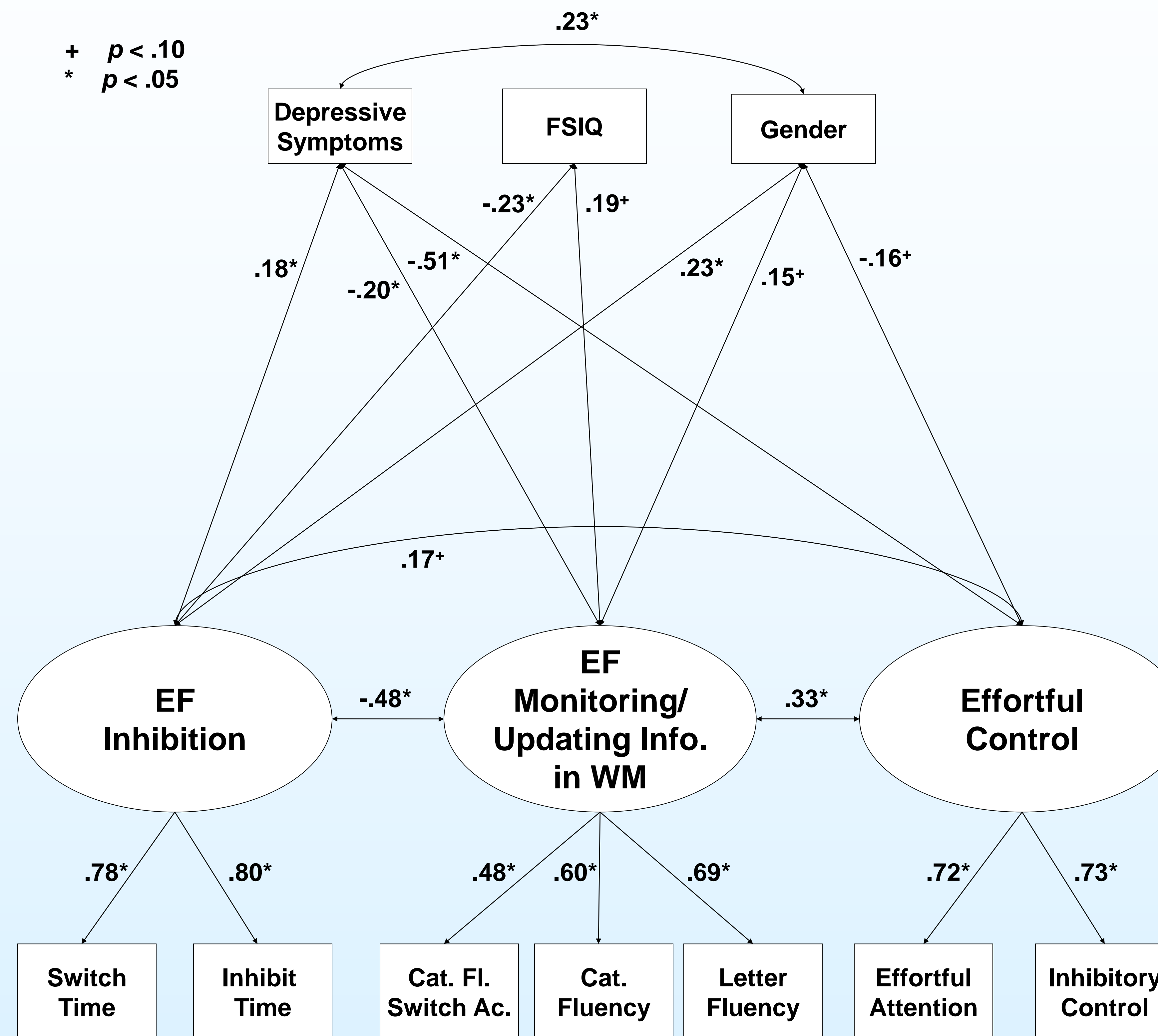
Method – Measures

- EF Inhibition: Delis-Kaplan Executive Function System (D-KEFS)⁹
 - Color-Word Inference Test – Inhibition Time, Inhibition-Switching Time
- EF Monitoring/Updating Information in Working Memory (WM): D-KEFS⁹
 - Verbal Fluency Test – Letter Fluency Total Correct, Category Fluency Total Correct, Category Switching Accuracy
- EC: Adult Temperament Questionnaire - Short Form (ATQ-SF)²
 - Effortful Attention subscale
 - Inhibitory Control subscale
- Full Scale IQ (FSIQ): Wechsler Abbreviated Scale of Intelligence (WASI)¹⁰
 - Similarities and Matrix Reasoning Subtests
- Depressive symptoms: Beck Depression Inventory-II (BDI-II)¹¹

Method – Procedure

- Participants completed the BDI-II, ATQ-SF, and demographics during an individual lab session.
- Research assistants administered the D-KEFS and the WASI subtests to each participant.
- SEM, using EQS 6.1¹² software, was used to test hypotheses.

Results



- The SEM model was an excellent fit to the data:
 - $X^2(23) = 22.74, p > .05; CFI = 1.00; RMSEA = 0.00$ (90% CI: 0.00 – 0.06); $SRMR = 0.037; AIC = -23.26$
- There was a significant association between EC and the EF of Monitoring/Updating Information in Working Memory; a trend in the anticipated direction was observed between EC and the EF of Inhibition.
- Consistent with Miyake's (2000)³ model, the significant relationship between the EF of Inhibition and the EF of Monitoring/Updating Information in Working Memory demonstrates that these EFs are core aspects of higher-order cognition.
- Depressive symptoms were significantly associated with all three latent variables.
- Full Scale IQ (FSIQ) and Gender, with women performing more poorly than men, were associated with the EF of Inhibition.
- A trend such that FSIQ was associated in the expected direction with the EF of Monitoring/Updating Information in Working Memory was observed.
- Trends such that women obtained lower scores than men on the EF of Monitoring/Updating Information in Working Memory and EC were observed.

Conclusion

- This study has linked different sub-disciplines within psychology in order to better understand mechanisms of self-regulation.
- The broad EC construct was most closely linked with the EF of Monitoring/Updating Information in Working Memory, but not the EF of Inhibition.
- Results indicate that findings related to EC may have relevance to studies of EFs, and vice versa.
- This study suggests some EFs could potentially be considered temperament-like characteristics.
- Furthermore, these results provide support for a move towards more unity of EFs and EC.
- Future work could include the third aspect of EF (Attention Shifting) from Miyake's (2000)³ model to examine links with EC.
- A multi-method approach could be taken to evaluate EC (e.g., the Attention Network Test along with self-report measures) in future studies.

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