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ORIGINAL ARTICLE

Do Cognitive Resources Matter for Eudaimonia? The Role of Inhibitory Control in Psychological Well-being

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Abstract
Although past work has investigated the psychosocial and biological correlates of psychological well-being (PWB), little is known regarding the cognitive underpinnings of PWB. Given that prior research has predominantly relied on indices of general cognitive abilities and PWB, we examined the relations between Ryff's (1989) six-factor model of PWB and inhibitory control (i.e. the ability to actively maintain pertinent goals by resisting interference from irrelevant information or prepotent responses). Using structural equation modelling ($N = 170$), based on three inhibition measures and six facets of PWB, we found that better inhibitory control was associated with greater personal growth, when cognitive, demographic, and personality covariates were controlled for. Additionally, there was equivocal evidence for the link between inhibitory control and positive interpersonal relations, and no other significant relations were found for other PWB dimensions (i.e. environmental mastery, purpose in life, autonomy, and self-acceptance). The asymmetric associations between inhibitory control and the various PWB facets emphasise the importance of a multidimensional approach for a more precise understanding of the cognitive correlates of PWB.

Keywords Inhibitory control · Psychological well-being · Personal growth · Positive relations

Eudaimonia refers to qualities that are pivotal to optimal psychological functioning and the realisation of one's unique potential (Ryff & Singer, 2008). A popular operationalisation of eudaimonia is Ryff's (1989) six-factor model of psychological well-being (PWB), which consists of (a) autonomy (evaluating oneself by personal standards); (b) environmental mastery (possessing a sense of mastery in managing

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various activities and opportunities); (c) personal growth (perception of continued development, self-knowledge, and effectiveness); (d) positive relations (having satisfying and trusting relations with others); (e) purpose in life (having important goals and meaning in life); and (f) self-acceptance (having a positive attitude toward oneself). Previous research has investigated the psychosocial (e.g. coping strategies) and biological (e.g. cardiovascular and inflammatory functioning) correlates of PWB (Ryff & Singer, 2008). However, despite the potential implications of self-regulatory processes (e.g. goal setting, goal striving, goal achievement, etc.) in PWB (Harzer, 2016), little research has been conducted to identify the cognitive control underpinnings of PWB. To this end, we focused on inhibitory control, i.e. the ability to actively maintain pertinent goals by resisting interference from irrelevant information or prepotent responses (Friedman & Miyake, 2004). Given that inhibitory control is regarded as a core element of self-regulatory processes such as goal-oriented actions and goal attainment (Hofmann et al., 2012; Mc Culloch et al., 2008), we sought to identify whether inhibitory control would be related to the different facets of PWB.

Inhibitory Control and Psychological Well-being

Eudaimonia, which includes the concept of PWB, is characterised by values, goals, and ideals, and hence recruits higher-order cognitive capacities (Huta, 2016) that promote effective self-regulation (i.e. modifying behaviours in line with personal goals and preferences). Moreover, self-regulatory behaviours—such as planning and organising personally important long-term goals, persevering on valued goals despite obstacles, and goal accomplishment and progress in pursuits of excellence—have been posited to be more aligned with PWB rather than hedonic well-being (i.e. feelings of pleasure and satisfaction; Huta, 2016). An integral component of self-regulation is inhibitory control (Hofmann et al., 2012; Strack & Deutsch, 2004), which relates to the top-down activation, representation, and maintenance of goal-related information, particularly in the presence of task-irrelevant information or prepotent responses (Chatham et al., 2012; Egner & Hirsch, 2005; Hampshire et al., 2010; Miller & Cohen, 2001). Accordingly, inhibitory control facilitates self-regulatory behaviours through prioritising valued long-term goals over short-term impulses and distractions and avoiding situations that trigger goal-detracting temptations (Hofmann et al., 2012; Strack & Deutsch, 2004). Past work has shown that poorer inhibitory control is affiliated with more dysfunctional impulse control, which reflects a failure of self-regulatory goal maintenance and is a key risk factor for addictive behaviours (e.g. substance abuse, internet addiction; Dong et al., 2010; Fillmore & Weafer, 2013) and psychiatric disorders (e.g. anxiety and mood disorders; Goeleven et al., 2006); Penadés et al., 2007). Correspondingly, inhibitory control has been documented to facilitate goal maintenance and progression across various aspects of life, such as school readiness, occupational success, and marital harmony (Diamond, 2013)). Considering the goal-facilitating role of inhibitory control, it is plausible that inhibitory control would positively contribute to PWB.

Empirical evidence, albeit limited, hints at a possible link between inhibitory control and PWB. For instance, Lee and Chao (2012) showed that young adults with better inhibitory control reported higher life satisfaction and lower depression. Sauer et al. (2011) found that behavioural inhibition mediates the relation between mindfulness and well-being in young adults. Similarly, in middle-aged and older adults, overall performance on a battery of cognitive tasks, which include measures that require inhibitory control (e.g. verbal fluency task; Hirshorn & Thompson-Schill, 2006), was positively correlated with general well-being that contained eudaimonic (i.e. perceptions of control, autonomy, self-realisation) and hedonic (i.e. pleasure) components (Llewellyn et al., 2008). Another study using similar cognitive and well-being measures found that general well-being in adults aged 50–90 years was predominantly explained by longitudinal changes in measures that tap inhibitory control (i.e. fluency tasks) rather than changes in other cognitive domains (e.g. processing speed or long-term memory) or general cognitive ability (based on a composite score of processing speed, memory, and executive functioning measures) in older adults (Allerhand et al., 2014). Other longitudinal studies based on older adult cohorts found that more rapid declines in global cognitive functioning, which encompassed inhibitory control (as assessed by the Stroop task), were associated with lower levels of purpose in life (Wilson et al., 2013). Moreover, purpose in life, in turn, prospectively predicted cognitive decline (Boyle et al., 2010) and attenuated the deleterious effects of pathologic changes in Alzheimer's disease on the rate of cognitive decline (Boyle et al., 2012). Together, these findings suggest that certain features of cognitive abilities, such as inhibitory control, may be concomitant with higher levels of PWB.

Despite the importance of these findings, several limitations exist. First, due to reliance on general cognitive functioning, previous findings offer indirect evidence on a possible link between inhibitory control and PWB. Notably, inhibitory control has been shown to be theoretically and empirically distinct from other cognitive abilities (e.g. intelligence, processing speed, memory; Friedman et al., 2006, 2008; Unsworth et al., 2014). Hence, it remains to be seen whether inhibitory control would be uniquely related to PWB. Moreover, past studies have predominantly assessed the association between cognitive abilities and composite indices of general PWB (e.g. Allerhand et al., 2014; Llewellyn et al., 2008) or single-dimensional measures of PWB (e.g. purpose in life, Boyle et al., 2010, 2012). However, it is essential to examine whether inhibitory control is more closely affiliated with specific PWB dimensions (i.e. environmental mastery, personal growth, positive relations, and purpose in life) that involve goal-directed behavioural regulation than others (i.e. autonomy and self-acceptance; Wilson et al., 2013). To illustrate, given the centrality of inhibitory control in goal monitoring and management processes (Friedman & Miyake, 2017; Kane & Engle, 2003), individuals with more proficient inhibitory control may have a greater sense of mastery and competence in regulating external activities and situations in accordance with personal preferences and needs (i.e. environmental mastery). Likewise, given the goal-facilitating role of inhibitory control in the attainment and expansion of various skills and knowledge (e.g. language and scholastic learning; Bull et al., 2008; Cragg & Gilmore, 2014; Gathercole & Baddeley, 1993), better inhibitory control may be concomitant with sustained self-improvement and the advancement toward one's true potential (i.e. personal growth).

Further, inhibitory control has been found to facilitate pro-relational goals by overriding destructive impulses (e.g. aggression) in service of the relation-protective behaviours (e.g. forgiveness) that sustain long-term interpersonal relations (Pronk & Righetti, 2015). Corroborating this notion, past work has highlighted the function of inhibitory control in adaptive socialisation and communication skills (Clark et al., 2002). In a related vein, deficits in inhibitory control have been shown to be linked to interpersonal aggression (Hoaken et al., 2003). In this regard, higher inhibitory control may translate into more positive relations with others. Moreover, purpose in life, which entails self-reflective processes, integration of diverse experiences, and planning and organising future goals and priorities, has been hypothesised to implicate inhibitory control and other executive function processes (Wilson et al., 2013). Consistent with these findings, age-related cognitive declines have been shown to be more strongly correlated with the functional aspects of PWB—such as environmental mastery, personal growth, positive relations with others, and purpose in life—than with predominantly affective or attitudinal aspects of PWB (i.e. self-acceptance and autonomy; Wilson et al., 2013). Given the dearth of research on this subject, therefore, further investigation is required to identify how inhibitory control is related to the specific dimensions of PWB.

Second, past studies have used composite scores of multiple tasks to index cognitive functioning and have often relied on a single task to represent inhibitory control (e.g.Boyle et al., 2010; Llewellyn et al., 2008). Notably, inhibitory control tasks tend to assess other non-inhibitory constructs (e.g. verbal ability) apart from inhibitory control per se (known as the task-impurity problem; Friedman & Miyake, 2004), which causes interpretative problems in the link between inhibitory control and PWB. Such task-specific variances may obfuscate genuine relations between inhibitory control and PWB, on the one hand, or result in specious relations between non-inhibitory-control constructs and PWB, on the other hand, thereby limiting the conclusiveness of previous findings. Hence, more rigorous methodological approaches are needed to address the task-impurity issue.

The Present Study

Given the paucity of direct evidence on the link between inhibitory control and specific PWB dimensions, we investigated whether inhibitory control would be related to six specific facets of PWB, as delineated by Ryff's (1989) model of psychological well-being. Further, to address the task-impurity problem, we employed a latent-variable approach based on multiple measures of inhibitory control. Notably, the latent-variable approach accounts for measurement errors by extracting the common variance across inhibition measures, thereby granting a more precise estimation of inhibitory control. Additionally, to ascertain the unique contribution of inhibitory control to PWB, we controlled for cognitive (i.e. fluid intelligence), demographic (i.e. gender, socioeconomic status), and personality (i.e. extraversion, neuroticism) covariates that have been shown to influence either inhibitory control or PWB (Arffa, 2007; Augusto Landa et al., 2010; Clarke et al., 2000; Kaplan et al., 2008). Based on the reviewed literature (e.g. Wilson et al., 2013), we hypothesised that inhibitory control would be associated with the functional (i.e. environmental mastery, personal growth, positive relations with others, and purpose in life) but not with the attitudinal (i.e. self-acceptance and autonomy) aspects of PWB.

Method

Participants

Undergraduate students ($N = 170$; $M_{age} = 21.68$ years, $SD_{age} = 2.03$) from a university in Singapore participated in the study for course credit or a cash reward. All participants were included in analyses as long as they were fluent English speakers and had normal or corrected-to-normal vision. The sample size met the minimum requirement of $N = 152$ for a structural equation model comprising two latent variables with three manifest variables each (see "Results") in order to detect a medium effect size of 0.30 at 80% power based on Monte Carlo simulations (1,000 iterations). Since the data analysed were drawn from a larger study, only variables pertinent to the study's goals were analysed (see Table 1 for descriptive statistics).

Materials

Psychological Well-being

A 42-item psychological well-being questionnaire (Ryff, 1989) was used to assess six dimensions of PWB (1 = *strongly disagree*, 7 = *strongly agree*): (a) autonomy (e.g. "I have confidence in my opinions, even if they are contrary to the general consensus"); (b) environmental mastery (e.g. "I am quite good at managing the many responsibilities of my daily life"); (c) personal growth (e.g. "I have the sense that I have developed a lot as a person over time"); (d) positive relations with others (e.g. "I enjoy personal and mutual conversations with family members or friends"); (e) purpose in life (e.g. "I enjoy making plans for the future and working to make them a reality"); and (f) self-acceptance (e.g. "In general, I feel confident and positive about myself").

Inhibitory Control

Three measures were employed to assess the ability to actively maintain task goals while resisting task-irrelevant information or prepotent responses (Friedman & Miyake, 2004).

Antisaccade Task In this task, adapted from Unsworth and McMillan (2014), participants were asked to identify a target letter (*B*, *P*, or *R*) flashed momentarily on one side of the screen, while ignoring a distractor ("=") on the opposite side of the screen. In every trial, a fixation point first appeared in the centre of the screen (200 to 2200 ms). The distractor was presented either on the left or right side of

Table 1 Descriptive statistics of inhibitory control, psychological well-being, and covariates

	M	*SD*	Min	Max	Skewness	Kurtosis	Reliability[1]
Inhibitory control[2]							
Antisaccade	0.73	0.17	0.26	1.00	−0.76	−0.27	.93
Go/no-go	0.48	0.19	0.01	0.91	−0.18	−0.54	.93
Stroop[3]	14.18	1.92	1.29	16.19	−2.57	11.37	.79
Covariates							
Gender (% female)[4]	66.3	–	–	–	–	–	–
Household income[5]	4.22	2.37	1.00	9.00	0.54	−0.62	–
Fluid intelligence	6.41	1.93	0.00	9.00	−0.77	0.25	.67
Extraversion	2.82	0.94	1.00	4.75	0.13	−0.82	.84
Neuroticism	3.04	0.84	1.00	5.00	−0.01	−0.08	.74
Psychological well-being							
Autonomy	3.77	0.78	1.29	5.86	−0.03	0.11	.78
Environmental mastery	3.79	0.69	1.43	5.14	−0.34	0.35	.75
Personal growth	4.42	0.68	2.86	6.00	−0.08	−0.70	.76
Positive relations	4.37	0.82	1.57	6.00	−0.47	0.43	.80
Purpose in life	4.15	0.81	1.43	6.00	−0.23	0.27	.80
Self-acceptance	3.76	0.88	1.14	6.00	−0.58	0.58	.84

[1]Reliability estimates were computed based on Cronbach's alpha, except for the Stroop task, which was derived from Spearman-Brown adjusted split-half correlations

[2]Due to administrative and technical errors, data were missing for the antisaccade ($n = 1$), go/no-go ($n = 1$), and Stroop ($n = 4$) tasks

[3]For the Stroop task, average bin scores were reverse-coded so that higher values reflect better inhibitory control

[4]Gender was coded as 0 = *female*, 1 = *male*

[5]Household income (monthly) was used as an index of socioeconomic status (1 = $2500, 9 = $20,000)

the screen (100 ms), followed by a blank screen (50 ms) and then the same distractor (100 ms) again. Subsequently, a blank screen (50 ms) appeared, followed by the target letter (150 ms), which always appeared on the opposite side of the screen relative to the position of the previously presented distractor (i.e. when the distractor appeared on the left side of the screen, the target appeared on the right and vice versa). Thereafter, the target stimulus was first masked by the letter *H* (50 ms), and then by the number *8*, until a response was given. There were 24 practice trials, followed by 72 experiment trials. The dependent variable was the proportion of correct responses, with higher scores denoting better performance.

Go/No-Go Task In this task, adapted from McVay and Kane (2009), participants were instructed to respond, by pressing the spacebar on the keyboard when non-*X* letters were shown (i.e. go trials) and withhold from responding when the infrequent target *X* letter was shown (i.e. no-go trials; 11% of the time). In every trial, a letter stimulus was first presented for 300 ms, followed by a blank screen that lasted for 700 ms or until a response was given. There were 445 go trials and 55 no-go trials.

The proportion of correct responses on the no-go trials was used as the dependent variable.

The Stroop Task In this task, adapted from Unsworth and McMillan (2014), participants had to discern the colour of a word instead of reading the word. In each trial, a fixation point (500 ms) was first shown, followed by the target word, which remained on the screen until a response was given. Participants were asked to identify, as quickly and accurately as possible, the colour of the target word by pressing the *R* (red), *Y* (yellow), *G* (green), or *B* (blue) key. To ensure a sufficient level of difficulty, incongruent trials (e.g. *red* printed in green ink) were infrequently presented (33% of the time), relative to the congruent trials (e.g. *blue* printed in blue ink). There were 10 practice trials and 216 experimental trials.

The dependent measure was reverse-coded bin scores, which combined reaction time (RT) and accuracy. Following Hughes et al. (2014), we first excluded the following: (a) incorrect trials, (b) trials with RTs below 200 ms, and (c) trials with RTs that departed from each participant's mean RT by more than 3 *SD*. Second, each participant's mean RT across all congruent trials was deducted from the RT of every accurate incongruent trial. Third, all participants' difference scores were rank ordered into deciles as a group and assigned bin values ranging from 1 (fastest 10%) to 10 (slowest 10%). A bin value of 20 was assigned for each inaccurate incongruent trial. Fourth, a single bin score for each participant was computed by averaging the bin values for accurate and inaccurate incongruent trials. Last, bin scores were reverse-coded, with higher values signifying better performance. Bin scores have been shown to have better reliability and validity, and to better detect larger effect sizes than pure RT or accuracy scores (Hughes et al., 2014).

Covariates

To examine fluid intelligence, a nine-item short form of the Raven's Standard Progressive Matrices (RSPM-SF; Bilker et al., 2012) was used. A series of geometric designs, each with a missing segment, was shown and participants had to choose the segment that completed each geometric pattern. A higher number of correct responses reflected better fluid intelligence. Next, extraversion (e.g. "I talk to a lot of different people at parties") and neuroticism (e.g. "I have frequent mood swings") were assessed by four-item subscales (1 = *strongly disagree*, 5 = *strongly agree*) from the Mini-International Personality Item Pool—Five-Factor Model measure (Mini-IPIP; Donnellan et al., 2006).

Procedure

The study consisted of three 1-h sessions, with a 1-day interval separating each session. In the first session, an array of questionnaires—which assessed demographic variables (e.g. gender, income), personality traits (i.e. Mini-IPIP), and fluid intelligence (i.e. RSPM-SF)—was administered. Subsequently, participants completed the antisaccade task and the PWB measure in the second session, followed by the go/no-go and Stroop tasks in the third session, along with other measures.

Results

All analyses were conducted with M*plus* 7.4 (Muthén & Muthén, 2015) using the full information maximum likelihood procedure. Inhibitory control and the six PWB dimensions were modelled as latent variables. Indicators for the inhibitory control latent factor were the antisaccade, go/no-go, and Stroop tasks. Indicators for each PWB latent factor were three parcels formed from their corresponding seven-item subscales of the psychological well-being questionnaire. Parcelling is appropriate for unidimensional constructs and offers demonstrable psychometric advantages (e.g. greater reliability, reduction of random error) relative to item-level indicators (Little et al., 2002). The following criteria were used to evaluate model fit (Hair et al., 2009; Hu & Bentler, 1998): root mean square error of approximation (RMSEA) values equal to or below 0.08 (acceptable) and 0.06 (good); standardised root mean squared residual (SRMR) values equal to or below 0.08 (good); and comparative fit index (CFI) close to or greater than 0.90 (acceptable) and 0.95 (good). All reported estimates were standardised. Zero-order correlations between all variables are presented in Table 2.

We first ensured that the indicators reflected their intended constructs by examining the six measurement models, which consisted of inhibitory control with each of the PWB dimensions, using confirmatory factor analyses. All indicators had significant factor loadings ($p\text{s} < 0.001$), and all measurement models demonstrated adequate to good fit (see Table 3). Further, given that past research has shown that while all six PWB dimensions are empirically separable, they share an underlying general PWB factor (e.g. van Dierendonck et al., 2007), we tested an additional measurement model in which we modelled a general PWB factor by using the mean scores of the six PWB dimensions as indicators. To achieve a good fit to the data for the general PWB factor model, we correlated the residuals between personal growth and purpose in life and between autonomy and environmental mastery, as suggested by modification indices.

Moving on to the structural models, we evaluated the relation of inhibitory control to the six specific PWB dimensions and the general PWB factor separately (see Table 4). Of the six PWB facets, only personal growth was positively associated with inhibitory control ($\beta = 0.48$, $SE = 0.10$, $p < 0.001$); all other relations between inhibitory control and PWB dimensions were not significant ($|\beta|\text{s} < 0.21$, $p\text{s} > 0.07$). Next, we controlled for crucial covariates in each model (i.e. gender, intelligence, income, extraversion, and neuroticism). We found that inhibitory control positively predicted personal growth ($\beta = 0.54$, $SE = 0.11$, $p < 0.001$) and positive relations ($\beta = 0.30$, $SE = 0.11$, $p = 0.005$) when each PWB dimension was tested separately. However, inhibitory control did not predict other PWB dimensions or the general PWB factor ($|\beta|\text{s} < 0.20$, $p\text{s} > 0.09$). These results highlight dissimilar patterns of relations between inhibitory control and PWB components.

Table 2 Zero-order correlations between inhibitory control, psychological well-being, and covariates

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Antisaccade	–													
2. Go/no-go	**.31**	–												
3. Stroop	**.31**	**.33**	–											
4. Overall PWB	.10	.12	**.16**	–										
5. Environmental mastery	.02	.03	.03	**.82**	–									
6. Autonomy	.11	.04	.06	**.66**	**.54**	–								
7. Personal growth	**.20**	**.26**	**.26**	**.77**	**.48**	**.37**	–							
8. Self-acceptance	.01	.06	.08	**.85**	**.71**	**.44**	**.58**	–						
9. Positive relations	.09	.12	.12	**.77**	**.59**	**.34**	**.56**	**.62**	–					
10. Purpose in life	.04	.05	**.22**	**.77**	**.53**	**.37**	**.64**	**.59**	**.47**	–				
11. Gender	**.17**	.15	−.01	−.14	.02	.08	−.12	−.15	**−.30**	−.14	–			
12. Intelligence	**.38**	**.17**	**.19**	.07	.05	.01	**.17**	.04	-.01	.08	.13	–		
13. Income	.10	−.09	.03	**.22**	**.22**	**.24**	.09	.13	**.16**	**.17**	−.14	.11	–	
14. Extraversion	.13	−.01	−.01	**.42**	**.35**	**.33**	**.37**	**.29**	**.42**	**.19**	-.01	.03	**.19**	–
15. Neuroticism	−.11	.03	.07	**−.49**	**−.59**	**−.36**	**−.26**	**−.45**	**−.36**	**−.27**	**−.24**	−.04	−.11	**−.23**

All values denote Pearson product-moment correlation coefficients. Significant results are marked in boldface, $p < .05$. Gender was coded as 0 = *female*, 1 = *male*. *PWB*, psychological well-being

Table 3 Model fit indices for inhibitory control with each psychological well-being dimension and general psychological well-being

	χ^2	*df*	RMSEA	SRMR	CFI
Environmental mastery	8.97	8	.027	.033	.994
Autonomy	10.56	8	.043	.033	.984
Personal growth	3.17	8	.000	.019	1.00
Self-acceptance	7.18	8	.000	.028	1.00
Positive relations	10.50	8	.043	.028	.990
Purpose in life	20.45	8	.096	.056	.946
General PWB	44.54	24	.071	.053	.961

χ^2, chi-square statistic; *df*, degrees of freedom; *RMSEA*, root mean square error of approximation; *SRMR*, standardised root mean-squared residual; *CFI*, comparative fit index; *PWB*, psychological well-being

Table 4 Standardised estimates for the relation between inhibitory control and psychological well-being

	EM	AU	PG	SA	PR	PL	GPWB
Unadjusted model							
Focal predictor							
Inhibitory control	.01 (.12)	.15 (.12)	**.48 (.10)**	.10 (.11)	.19 (.11)	.21 (.12)	.17 (.11)
Adjusted model							
Focal predictor							
Inhibitory control	−.10 (.11)	.14 (.13)	**.54 (.11)**	.09 (.14)	**.30 (.11)**	.17 (.15)	.20 (.12)
Covariates							
Gender	−.10 (.07)	.03 (.09)	**−.29 (.08)**	**−.30 (.08)**	**−.47 (.07)**	**−.25 (.08)**	**−.31 (.07)**
Intelligence	.03 (.08)	−.13 (.10)	−.05 (.10)	.01 (.09)	−.13 (.08)	−.01 (.10)	−.04 (.08)
Income	.13 (.07)	**.20 (.08)**	−.04 (.08)	.01 (.07)	.01 (.07)	.09 (.08)	.05 (.07)
Extraversion	**.29 (.08)**	**.22 (.08)**	**.31 (.08)**	**.20 (.07)**	**.34 (.07)**	.12 (.08)	**.28 (.06)**
Neuroticism	**−.62 (.06)**	**−.35 (.08)**	**−.29 (.08)**	**−.54 (.07)**	**−.42 (.07)**	**−.32 (.08)**	**−.56 (.06)**

Values represent standardised estimates (with standard errors in parentheses). *EM*, environmental mastery; *AU*, autonomy; *PG*, personal growth; *SA*, self-acceptance; *PR*, positive relations with others; *PL*, purpose in life; *GPWB*, general psychological well-being. Gender was coded as 0 = *female*, 1 = *male*. Significant values are marked in boldface, $p < .05$

Discussion

Our analyses yielded several notable findings. First, we found that better inhibitory control was concomitant with higher levels of personal growth, above and beyond the influence of cognitive (i.e. fluid intelligence), demographic (i.e. gender and socioeconomic status), and personality (i.e. extraversion and neuroticism) covariates. Our findings corroborate the idea that cognitive control processes, such as inhibitory control, are associated with certain aspects of PWB (Wilson et al., 2013). Specifically, the self-regulatory and goal-facilitating functions of inhibitory control (e.g. resisting short-term temptations that impede goal progression; Hofmann et al., 2012) may foster the acquisition, effectiveness, and expansion of an individual's repertoire of skills and knowledge, thereby promoting a sense of fulfilment and continued personal growth. This is, in part, consistent with the role of inhibitory control in various cognitive domains and skill development (e.g. language and academic learning; Bull et al., 2008; Cragg & Gilmore, 2014; Gathercole & Baddeley, 1993). Complementing extant research on inhibitory control and subjective well-being (e.g. Ihle et al., 2021; Toh & Yang, 2020; Toh et al., 2020), our finding demonstrates that inhibitory control is not only involved in hedonic well-being but eudaimonic well-being (i.e. personal growth).

Additionally, we found equivocal evidence for the link between inhibitory control and positive interpersonal relations. Findings from the adjusted model indicate that higher inhibitory control was related to more positive interpersonal relations, thereby alluding to the idea that inhibitory control may aid in the suppression of relation-harming impulses and the prioritisation of the relation-protective behaviours that preserve social harmony (Pronk & Righetti, 2015) which leads to more satisfying relations with others. Although this notion appears to be in line with past findings demonstrating that pro-relational functions of inhibitory control contribute to interpersonal harmony (Clark et al., 2002; Hoaken et al., 2003), it should be noted that the relation between inhibitory control and positive interpersonal relations reached statistical significance in our adjusted—but not unadjusted—model, thereby reflecting a suppressor effect. Further analyses indicate that gender, but not other covariates, was responsible for the suppressor effect; that is, the link between inhibitory control and positive interpersonal relations became significant only when gender differences in inhibitory control, which may not be related to positive interpersonal relations, was statistically removed. Given the lack of theoretical justification for this suppressor effect, the link between inhibitory control and positive interpersonal relations should be interpreted with utmost caution.

Further, we found that inhibitory control was not associated with other PWB dimensions (i.e. environmental mastery, purpose in life, autonomy, and self-acceptance). While the null findings for autonomy and self-acceptance are congruent with past findings, those involving environmental mastery and purpose in life appear to be inconsistent with previously reported positive relations (Boyle et al., 2010, 2012; Wilson et al., 2013). However, given that previous studies examined general cognitive abilities, rather than inhibitory control, the reported relations of inhibitory control with environmental mastery and purpose in life may have been driven by non-inhibition domains instead. For instance, purpose in life, which relates to the integration of past experiences and organisation of future goals, may involve non-inhibitory control cognitive processes (e.g. memory) as well as motivational (e.g. proactive engagement) and sociocultural (e.g. religion) factors (Francis, 2013; Hill et al., 2014). In regard to environmental mastery, the contribution of inhibitory control to managing everyday affairs and contexts is less apparent in young adults, who are at their peak cognitive capacity. Indeed, past research has shown that cognitive factors, such as inhibitory control, play a more prominent role in perceptions of control (i.e. competence in managing goals and overcoming obstacles) with advancing age (Lachman & Andreoletti, 2006; Soederberg Miller & Lachman, 2000; Toh et al., 2020). Therefore, other noncognitive, contextual factors (e.g. harsh familial environment; Taylor et al., 2006) may be more predictive of environmental mastery during young adulthood. To this end, a promising line of inquiry for future research would be to examine age-graded differences in the relations between inhibitory control and PWB.

Our study is not without limitations. First, given that we focused on inhibitory control, the contributions of other dimensions of executive function, such as updating (i.e. manipulating information within mental workspace) and shifting (i.e. switching between multiple mental sets), to PWB remain to be identified. For instance, updating may be involved in the integration of past experiences and planning for future goals (i.e. purpose in life), while shifting may be required in switching from ineffective actions and plans to more effective ones in the successful management of situational demands (i.e. environmental mastery). Hence, future research should investigate how other domains of executive function would be related to the various PWB facets.

Second, the inhibitory control measures in our study assessed the ability to suppress prepotent or dominant responses. Other inhibitory operations, such as proactive interference (i.e. suppressing memory intrusions from no-longer-relevant information; Friedman & Miyake, 2004), likely aid in self-regulatory behaviours and goal pursuit, and thus future studies should explore whether other forms of inhibitory control are implicated in PWB.

Third, we are unable to ascertain the directionality of the relation between inhibitory control and PWB due to the correlational nature of our study. Notably, considering the malleability of inhibitory control to consistent practice (Diamond, 2013), it is possible that certain aspects of PWB modulate inhibitory control. Specifically, maintaining positive relations with others requires frequent relation-protective behavioural regulation, which may confer benefits on inhibitory control over time. Further, individuals with higher levels of personal growth, who are inclined to self-improvement and perceiving challenges as opportunities for development, would likely engage in various activities that augment skills and abilities, which may include inhibitory control. Therefore, future work should explore the potential reciprocal relations between facets of PWB and inhibitory control using longitudinal designs.

Fourth, it should be noted that our findings are based on young adults and, therefore, it is unknown how the observed pattern of findings would generalise to older cohorts. Considering age-related differences in both inhibitory control and specific aspects of PWB (e.g. environmental mastery, autonomy, and positive relations; Clark et al., 2012; Ryff & Keyes, 1995), the link between inhibitory control and PWB may differ with age. For instance, past findings show stronger associations between cognitive abilities and behavioural outcomes (e.g. sense of control) for older adults than for middle-aged or younger adults (Soederberg Miller & Lachman, 2000; Toh et al., 2020). Hence, future work should investigate potential age-graded differences in the link between inhibitory control and PWB across the lifespan.

In summary, our results build on previous findings that have relied on general indices of cognitive functioning and PWB (Allerhand et al., 2014; Llewellyn et al., 2008) by clarifying that inhibitory control is a key cognitive factor that is involved in domain-specific aspects of PWB (i.e. personal growth). This underscores the utility of adopting a multidimensional approach in order to attain a more precise understanding of the cognitive correlates of PWB.

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Data Availability Data that support the findings of this study are available on request from the authors.

Declarations

Competing Interests The authors declare no competing interests.

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