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Trait self-control, emotions, and openness to alternative viewpoints

Ming-hong TSAI
Singapore Management University, mhtsai@smu.edu.sg

Norman P. LI
Singapore Management University, normanli@smu.edu.sg

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Ming-Hong Tsai *, Norman P. Li

School of Social Sciences, Singapore Management University, Singapore

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ABSTRACT

We examined openness to alternative viewpoints as an unexplored consequence of trait self-control. We conducted three studies to investigate the relationship between trait self-control and openness to alternative viewpoints during situations with different opinions and to explore various emotions as potential mediators of this relationship. Our results demonstrated a positive relationship between trait self-control and openness, and this relationship was mediated by decreased anger and increased emotions with positive valence, including attentiveness and serenity. In addition, trait self-control was negatively related to fatigue, but the relationship between fatigue and openness was not consistently significant across the studies. These findings clarify the relationships between trait self-control and emotions and elucidate why individuals consider others' different perspectives.

Introduction

In 2013, the mayor of New York City, Michael Bloomberg, discussed why he and the United Federation of Teachers (UFT) were unable to reach an agreement regarding a new teacher evaluation system (Bloomberg, 2013): both parties insisted on their own viewpoint and rejected to consider each other's perspective. Bloomberg felt that the demands of the UFT would make it difficult to remove ineffective teachers from the school system whereas the UFT wanted more power for teachers to challenge the evaluation process (Baker and Santora, 2013). An agreement between the Bloomberg administration and the UFT before the mandated deadline would have allowed the city schools to receive $250 million dollars in aid from the state government and up to an additional $200 million dollars in federal grants. Despite the potential gains, the discussion failed to produce a consensus, resulting in poor outcomes for both parties and ultimately, the students of New York City.

As this example illustrates, opposing opinions are bound to occur when individuals negotiate or make joint decisions. As such, successful conflict resolution may depend on how open they are to alternative perspectives. Openness to alternative viewpoints is a response to a situation that may involve different opinions and reflects the extent to which people consider different ideas and suggestions from another person in a receptive manner (Tröster and van Knippenberg, 2012; Tsai and Li, 2020; Tsai et al., 2020). The open-minded responses positively affect various interpersonal dynamics, such as unique information sharing (Tsai and Bendersky, 2016) and participation in collaborative discussions (Hobman et al., 2004). Indeed, limited openness is associated with high levels of aggressive behavior (Sharma and Raju, 2013) and relationship conflict (Ayub et al., 2017).

What makes individuals who come into conflict open versus closed to alternative perspectives? We propose that a major determinant is trait self-control – the dispositional capacity to control an individual's feelings, thoughts, and actions (Tangney et al., 2004). Reflecting its importance, consequences of trait self-control have been examined in over 100 studies across different domains, such as school, work, relationships, and adjustments (reviewed in de Ridder et al., 2011). Low trait self-control has been found to be related to various negative social consequences, such as a high likelihood of criminal conviction (Moffitt et al., 2011) and the escalation of opinion differences to personal attack (Jimmieson et al., 2017). In contrast, high trait self-control is linked to various beneficial outcomes, such as superior academic performance (Duckworth and Seligman, 2005) and greater relationship satisfaction (Tangney et al., 2004).

We also propose emotions as mediators of the positive association between trait self-control and openness. To broaden the scope of emotions, we investigate four emotions representing different levels of valence and arousal (Russell, 1980). We focus on fatigue and anger as negative emotions with low and high arousal, respectively, following previous research that examined these emotions as mediators of how an ego depletion task (i.e., a task designed to deplete self-control resources) influenced openness to dissenting viewpoints (Tsai and Li, 2020).

* Corresponding author.
E-mail address: mhtsai@smu.edu.sg (M.-H. Tsai).

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Moreover, researchers consider anger and attentiveness as two of the most common emotions with high arousal during opinion differences (Todorova et al., 2014). Indeed, these two emotions share similar levels of arousal based on the classification of emotions from Pressman and Cohen (2012). Given that attentiveness is a key positive emotion (Watson and Clark, 1994) and that Pressman and Cohen (2012) only studied fatigue and serenity as emotions with low arousal, we also used serenity as a positive emotion with low arousal in the present investigation. To summarize, we examine fatigue, anger, attentiveness, and serenity as mediators of the association between trait self-control and openness to alternative viewpoints.

Our research offers novel insights into research on trait self-control and its consequences in two essential aspects. First, we identify trait self-control as a previously unexplored precursor of openness to alternative viewpoints. Although previous research studied the effect of ego depletion on openness (Tsai and Li, 2020), this research did not show consistently significant negative effects of ego depletion (or depletion of self-control resources) on openness. By contrast, we propose a reliable positive association between trait self-control and openness. Moreover, researchers have gradually shifted away from a view that ego depletion and trait self-control are synonymous constructs (Forestier et al., 2022), following a recent meta-analysis with preregistered studies showing that trait self-control does not moderate the effect of ego depletion on self-control performance (Vohs et al., 2021). Thus, the current research sought to clarify whether ego depletion and trait self-control differentially predict openness.

Second, we investigate four emotions as mediators of the associations between trait self-control and openness in situations with dissenting opinions. In such situations, trait self-control may allow individuals to regulate their emotions effectively because it predicts a lower frequency of emotional fluctuations (Layton and Muraven, 2014). Moreover, Tsai and Li (2020) studied only fatigue and anger as mediators of the association between ego depletion and openness and did not find a consistently significant positive effect of ego depletion on fatigue. Conversely, the current investigation expands the categories of emotions by including attentiveness and serenity and predicts a stable negative association between trait self-control and fatigue. Therefore, the present research illuminates whether ego depletion and trait self-control are differentially associated with openness via emotions.

The role of trait self-control and openness

When people have different opinions about a particular issue, trait self-control may predict whether they focus on their own interests or consider others' needs (Rhoades and Carnevale, 1999). Researchers have proposed that self-control can override the desire to criticize opponents and motivate engagement in open discussions regarding conflict solutions (Bornstein et al., 2017). Furthermore, people with high trait self-control form behavioral routines that allow for an effortless avoidance of a conflict between an immediate desire and a long-term goal (Gillebaart and de Ridder, 2015). Thus, those with high trait self-control may have an adaptive habit of listening to and considering others' viewpoints without giving in to urges to promote their own viewpoints in situations with dissenting opinions. By doing so, they can achieve the goal of making joint decisions. Trait self-control also positively predicts an open discussion of feelings and resolutions to a conflict situation (Bornstein et al., 2017). In addition, it is negatively associated with aggressive impulses (DeWall et al., 2007) and cheating behavior (Muraven et al., 2006). Accordingly, individuals with higher levels of trait self-control may be less likely to inflict costs upon others and more likely to consider others' needs and be open to their viewpoints.

How fatigue relates to trait self-control and openness

First, trait self-control may predict openness through decreased fatigue. Moreover, the cognitive exertion model of self-control may explain the negative association between trait self-control and fatigue (Wolff et al., 2019). Specifically, individuals with higher trait self-control may experience less mental exertion when performing tasks. For example, one study showed that individuals with higher trait self-control perceived less increase in cognitive exertion as they completed a strenuous physical task (Wolff et al., 2019). Relatedly, another study showed a negative association between trait self-control and feelings of tiredness (Baldwin et al., 2019). Thus, individuals with higher trait self-control may perceive less increase in cognitive exertion and thus, fatigue, during tasks with potential dissenting opinions.

Fatigue in turn may be positively or negatively associated with openness to alternative viewpoints. On one hand, researchers have proposed that individuals experiencing fatigue are susceptible to social influence (Burkley et al., 2011). Indeed, people with chronic fatigue syndrome tend to be receptive to others' suggestions (DiClementi et al., 2001). In addition, research in neuroscience has noted that when stress drains energy, the hormone oxytocin is released to reduce stress and fatigue (Olff, 2012). Oxytocin increases a self-perception of openness to new experiences (Cardoso et al., 2012). Relatedly, people with higher levels of fatigue are more likely to expend effort to maintain interpersonal relationships (Halbesleben and Bowler, 2007). Such a relational tendency may be associated with greater propensities for openness to perspectives from others. Thus, fatigue may positively predict high levels of openness to alternative viewpoints.

On the other hand, fatigue may be negatively associated with openness to alternative viewpoints because this process can consume substantial resources that fatigued people may not perceive they have (Lapointe et al., 2011). Furthermore, individuals experiencing fatigue may focus on themselves by striving for significant resources to recover their energy (Cropanzano et al., 2003), and thus are less open to others' concerns. Indeed, research showed that exhaustion is negatively related to helping behaviors (Trougakos et al., 2015) and perspective-taking (Lamothe et al., 2014). Employees who suffered from fatigue also avoided engaging in voluntary behaviors that could benefit their organizations (Cropanzano et al., 2003). Thus, while it appears that trait self-control is negatively related to fatigue, it remains unclear how fatigue is associated with openness to alternative viewpoints.

How anger relates to trait self-control and openness

Trait self-control may positively predict openness to alternative viewpoints through decreased anger. In particular, the reduced anger rumination model of self-control regards trait self-control as an inhibitory strength that prevents immediate urges from being transformed into undesired actions (e.g., aggressive behavior) and thus, can restrict anger rumination – impulsive drives to recall thoughts repeatedly about angering experiences (Li et al., 2019). Moreover, people with high self-control have sufficient metacognitive knowledge; they use different regulatory strategies depending on situations (Bürgler et al., 2021, 2022; Hennecke and Bürgler, 2022). Consequently, they may use a cognitive change strategy (i.e., a reappraisal of a situation to influence its affective effects; e.g., Bonanno and Burton, 2013; Duckworth et al., 2014) during discussions with diverse opinions, such as reinterpreting others' criticisms as useful feedback to avoid angry responses. They may also use a distraction strategy (e.g., Hennecke and Bürgler, 2020; Lopez et al., 2021), such as exchanging information about common interests to distract themselves from others' dissenting opinions, and thus reduce the likelihood of experiencing anger. Past research has also linked lower self-control to greater anger. For example, children with inferior self-control had more angry conflicts with others and expressed more hostile responses to anger-related stimuli than did those with superior self-control (Murphy and Eisenberg, 1997). Relatedly, when provoked by a fictitious fellow student, people who received self-control training reported a lower level of anger than those who did not receive this training (Denson et al., 2011). Therefore, trait self-control may reduce the likelihood of experiencing anger caused by dissenting opinions.

In addition, individuals become angry toward and have a desire to inflict negative consequences on people who prevent them from achieving their goals (Lebel, 2017). As such, angry individuals may refuse to accept dissenting opinions, which block their desired outcomes. Angry individuals have also been found to have low regard for the interests of negotiation counterparts (Allred et al., 1997), reject others' offers (Pillutla and Murnighan, 1996), and use tactics to maximize their self-interest at the expense of others' interests (Olekalns and Smith, 2003). These findings suggest that anger may prevent people from being open to others' views because angry individuals may emphasize their own goals over others' needs. Taken together, trait self-control may be related to higher openness to dissenting opinions via decreased anger.

How attentiveness and serenity relate to trait self-control and openness

Trait self-control may be positively associated with openness to alternative viewpoints through increased positive emotions (i.e., attentiveness and serenity). The goal balance model of self-control predicts that individuals with higher trait self-control will experience more positive emotions because they can better balance their different goals (Hofmann et al., 2014). Specifically, those with trait self-control are more effective at handling conflicts between short-term desires (e.g., eating unhealthy food or advocating personal preferences) and high-level goals (e.g., promoting health or maintaining group decision quality and efficiency) by making and sticking to plans to achieve their high-level goals and avoid activities involving enticing temptations with negative consequences. Hoffman et al. (2014) also found a positive link between trait self-control and positive emotions in life. Moreover, individuals with higher trait self-control considered themselves to be happier people (Cheung et al., 2014). During discussions with dissenting opinions, people with higher trait self-control may strive for a goal of joint decision-making for their groups rather than focus on personal desires (e.g., advocating one's opinions and rejecting others' suggestions), thus maintaining higher levels of positive emotions. Moreover, the use of self-regulatory strategies predicts state-levels of self-regulatory success during daily self-control conflicts, including the adoption of a process focus among other strategies (Wenzel et al., 2023). Thus, people with high self-control may direct their attention to a discussion process rather than impose their preference or undermine others' influence. Conjointly, trait self-control may positively predict both attentiveness and serenity.

Individuals who experience higher positive emotions may in turn be more open to alternative perspectives. Positive emotions are regarded as resources that can broaden awareness and promote exploration of novel ideas and actions (Fredrickson, 2013). More specifically, positive emotions lead to engagement with a current environment and participation in corresponding activities (Fredrickson, 2001). Consistent with results demonstrating a positive link between positive emotions and helping behavior (Isen and Levin, 1972), individuals with higher positive emotions may be more likely to consider others' needs or different points of view. Therefore, attentiveness and serenity may facilitate a positive association between trait self-control and openness to alternative viewpoints.

Overview of the studies

The literature review suggests that greater trait self-control may allow individuals to respond more openly to alternative viewpoints. In addition to examining this link, we also aimed to investigate fatigue, anger, and positive emotions (attentiveness and serenity) as mediators based on the cognitive exertion, reduced anger rumination, and goal balance models of self-control, respectively. We used measures of anger and fatigue in Studies 2 and 3 and measures of attentiveness and serenity in Study 3. We also used Statistical Package for the Social Sciences (SPSS) to perform all the statistical analyses except for confirmatory factor analyses. Our confirmatory factor analyses were conducted using Mplus.

To increase generalizability, we used different task settings, different samples (i.e., university students and full-time employees), and various assessments of openness to alternative viewpoints (i.e., partner-evaluation, self-evaluation, and a choice task) across multiple studies. To determine a minimum sample size, we conducted power analyses based on the average effect size ($|\rho| = 0.26$) of the association between trait self-control and behavior from a meta-analytic report (de Ridder et al., 2011). With this effect size and a statistical power of 0.80 (Type I error rate = 5%, two-tailed), 109 participants served as a minimum sample size. Our sample sizes in all the studies were at least 135 participants, thereby alleviating the concern of insufficient power. The final sample sizes were determined by available resources and recruitment situations. Data collection was terminated within one academic year for Studies 1 and 2 and within one batch of participant recruitment for each wave of survey in Study 3. The data analyses were not conducted until after data collection was fully completed.[1]

Study 1: dyad task interaction

The purpose of Study 1 was to examine the hypothesized positive relationship between trait self-control and openness to alternative viewpoints. The research setting involved dyad discussions for specific tasks.

Participants and design

University students ($N = 198$, 62.63% female; age: $M = 20.93$, $SD = 1.79$) participated in a study for monetary remuneration. To prevent a potential spurious association caused by the measurement method (Podsakoff et al., 2003), we used a time-lagged design in which the outcome measure (i.e., an openness measure) is obtained at a time interval after the predictor measure (i.e., a measure of trait self-control). This design can mitigate the possibility that the priming effect of a first measure (i.e., memory retrieval of concepts relevant to the first measure) influences a second measure. These two measures were also assessed by different individuals to decrease an inflated association caused by a single data source. Furthermore, the independent variable (i.e., trait self-control) was assessed by a participant at the beginning of the study, and the dependent variable (i.e., openness to alternative viewpoints) was assessed by the participant's task partner at the end of the study.

Procedures and measures

Participants came to a large room for a laboratory study in which they were randomly organized into dyads. They first completed the 13-item Brief Self-Control Scale (Tangney et al., 2004). A sample item of this scale ($\alpha = 0.83$; 1= not at all; 7 = very much) is "I say inappropriate things (reverse-coded)." Participants then read materials about an idea selection and implementation task adapted and modified from Jessup et al. (1990). In this task, participants were asked to generate a slogan to increase public awareness about limited parking space and create a plan using this slogan to solve the parking problem. To associate dissenting opinions with task discussions, participants in each dyad first indicated two initial slogans individually and were requested to discuss their group slogan with their partner within 6 min. All the participants had different individual ideas within their assigned dyads before their discussions. Four participants in two dyad groups did not reach an agreement (i.e., impasse) in the first discussion. Then participants independently indicated two plans that used their group slogan or a

[1] The study materials, datasets, and analytic codes can be accessed at the link (https://osf.io/pyubg/?view_only=294728bd21464fab96301b02b6aa734c).

non-specific slogan to solve the problem of limited parking space depending on whether they achieved an agreement over their group slogan in the first discussion. Afterward, they were given 6 min to discuss their group plan. All dyad groups achieved a consensus on their group plans in the second discussion.

After dyad discussions, participants were requested to evaluate their partners' openness to alternative viewpoints during the discussions in which participants initially had different ideas. Participants used a 3-item scale ($\alpha = 0.89$; 1 = strongly disagree; 7 = strongly agree) adapted from the openness scale used by Tsai and Li (2020). The items included: "Good ideas get serious consideration from your partner," "Your partner is open to suggestions," and "If suggestions were made to your partner, they would receive fair evaluation." To ensure confidentiality, the evaluators were requested not to share any of their responses with their dyad partner. Participants also provided their demographic information at the end of the study.

Results and discussion

Table 1 presents descriptive statistics and Pearson correlation coefficients of the relationships among the focal variables in the three studies. We did not apply any corrections to the results of correlational analyses because we intended to present specific correlations between variables rather than compare multiple correlations. Due to the impasse in the first discussion for the two dyad groups, we created a variable to control the difference (i.e., impasse [Coding = 1] versus no impasse [Coding = 0]). Task impasse has been shown to be positively associated with negative perceptions of the task partners and an unwillingness to collaborate in the future (O'Connor and Arnold, 2001), which implicates a negative association between an impasse and openness to alternative viewpoints. However, the correlational coefficient demonstrated a non-significant positive association between impasse and openness ($r = 0.04$, $p = .615$), which suggests that the inclusion of impasse as a control variable might not substantially influence the results in subsequent analyses.

Self-control as a predictor

To examine trait self-control as a precursor of openness to dissenting opinions, we conducted mixed-effects regression analyses with maximum likelihood estimation and used a dyad identification number as a random-effect variable that controlled the differences among dyads (i.e., a random-intercept model). We also used the impasse situation in the first discussion as a control variable in the regression model. To compute standardized regression coefficients as an assessment of effect size, we standardized variables used in regression models and estimated the associations between predictors and outcome variables (Allen, 1997). We found that self-control was significantly positively related to openness when the control variable (i.e., impasse) was included ($b = 0.19$, $p = .007$, 95% CI = [0.05, 0.33]) or excluded ($b = 0.18$, $p = .008$, 95% CI = [0.05, 0.32]) in the regression model. Therefore, our results supported a positive association between self-control and openness.

Study 2: online interaction

To replicate the findings in Study 1 and examine emotional mediators of the association between trait self-control and openness to dissenting opinions, we examined how trait self-control is related to openness via fatigue and anger. This study utilized a task that required participants to discuss matters with an online confederate.

Participants and design

One hundred and thirty-seven undergraduate students participated in the study in exchange for course credit. Two participants were excluded because they did not answer the task comprehension check item correctly. Thus, the final sample included 135 participants (70.37% female; age: $M = 21.10$, $SD = 1.63$).

Procedures and measures

Participants arrived in a large room for an onsite study. They first

Table 1
Descriptive Statistics and Correlations in Studies 1–3.

Study 1	1.	2.	3.	4.	5		
1. Impasse							
2. Self-control	−0.10						
3. Openness	0.04	0.19**					
M	0.02	4.27	6.05				
SD	0.14	0.77	0.81				
Study 2	**1.**	**2.**	**3.**	**4.**	**5**		
1. Self-control							
2. Fatigue	−0.34***						
3. Anger	−0.36***	0.40***					
4. Openness Scale	0.18*	0.08	−0.32***				
5. Openness Choice	0.17*	0.03	−0.25**	0.54***			
M	3.95	2.88	1.97	4.99	0.77		
SD	0.83	1.52	1.08	1.17	0.42		
Study 3	**1.**	**2.**	**3.**	**4.**	**5.**	**6.**	**7.**
1. Empathy							
2. Self-control	0.18**						
3. Fatigue	−0.18**	−0.40***					
4. Anger	−0.08	−0.33***	0.56***				
5. Attentiveness	0.38***	0.19**	−0.30***	−0.30***			
6. Serenity	0.16**	0.29***	−0.37***	−0.56***	0.58***		
7. Openness	0.26***	0.23***	−0.41***	−0.52***	0.61***	0.59***	
M	5.27	4.98	2.01	2.18	5.21	4.86	5.73
SD	1.39	1.14	1.26	1.41	1.24	1.49	1.36

Notes. *$p < .05$; **$p < .01$; ***$p < .001$ (two-tailed). In Study 1, the impasse variable is coded based on whether or not participants had an impasse in the first discussion (1 = impasse; 0 = no impasse).

used a computer to complete the same scale of trait self-control (α = 0.84) as in Study 1. Next, participants read a task scenario in which they would work with their assigned partner in a mobile phone company to complete the task. Specifically, the company was trying to promote their new smartphone product, and they and their partner would generate and select a creative name for this product. Then they entered the initials they would like to be referred to by their assigned partner. They also answered a task comprehension check question, which indicated whether a representative from the company would like to reduce the number of mobile phones produced in the factory or generate a creative name for the product. If participants did not answer the question correctly, they would receive a reminder of the task scenario and could answer the same question up to two additional times. Two participants who consistently selected the wrong option (i.e., reduce the number of mobile phones) three times were excluded from our dataset for misinterpreting the task goal. Then participants were requested to indicate a creative name for this product and provide a reason why their proposed name was creative.

Afterward, participants read that they would be assigned to work with another participant, WN (i.e., the initials of the participants' task partner), and that according to a random draw, WN would first send them a message regarding their proposed name. To create realism regarding the online interaction and link the interaction to dissenting opinions, we created a message that involved a participant's initials and the partner's disagreement with the participant's proposed name: "Hi [Participant's Initials]. I disagree with your idea. [Participant's proposed name; e.g., "Smartie"] is not the most creative name. My intuition tells me that my idea, "Infome," is more creative. Next, participants reported their current emotions (1 = not at all, 7 = extremely) by completing the fatigue scale (3 items, i.e., "I feel sluggish/tired/drowsy"; α = 0.89) and the anger scale (3 items; i.e., "I feel hostile/angry/ irritated"; α = 0.88) from Tsai and Li (2020).

Lastly, participants rated their openness, engaged in a choice task regarding their openness to an idea from their task partner, and reported their demographics. To obtain openness ratings, participants completed a 3-item scale (α = 0.75; 1 = strongly disagree; 7 = strongly agree) modified from the openness scale in Study 1 to fit the setting of Study 2: "I am seriously considering WN's idea, "Infome"", "I am open to WN's idea, "Infome"", and "I will give WN's idea, "Infome", a fair evaluation." We also used a forced choice task to measure openness. Specifically, participants were given a choice to consider "Infome" as the name of the smartphone during the task discussion. Choosing to consider versus not to consider "Infome" as the name of the smartphone was regarded as a high level of openness (coding = 1) versus a low level of openness (coding = 0), respectively.

Results and discussion

Separation between emotions

To examine the distinctiveness of emotional constructs, we conducted comparative confirmatory factor analyses (CFAs). According to standards from Kline (2011), an acceptable factor model should have at least 0.90 for a comparative fit index (*CFI*) and less than 0.10 for a standardized root mean square residual (*SRMR*). Based on the standards, the CFA results supported the differentiation between the fatigue and anger measures. Specifically, the two-factor model met acceptable criteria: $\chi^2 = 13.49$, $df = 8$, $p = .096$, $CFI = 0.99$, $SRMR = 0.03$, but not the one-factor model: $\chi^2 = 190.91$, $df = 9$, $p < .001$, $CFI = 0.62$, $SRMR = 0.17$. A chi-square difference test showed that our two-factor model achieved a significantly better fit than the one-factor model: $\chi^2 = 177.42$, $df = 1$, $p < .001$.

Self-control as a predictor

We used the same approach (i.e., standardizing the variables in the regression models) as in Study 1 and conducted analyses of ordinary least squares (OLS) regression and logistic regression to examine continuous (i.e., openness scale) and categorical (e.g., openness choice) dependent variables, respectively. Table 2.1 presents all the regression models in Study 2. Self-control was significantly positively associated with openness (scale: $b_{[Model\ 1]} = 0.18$, $p = .033$, 95% CI = [0.02, 0.35]; choice[2]: $Exp(b)_{[Model\ 2]} = 1.55$, $p = .048$, 95% CI = [1.00, 2.39]) and negatively associated with fatigue ($b_{[Model\ 3]} = -0.34$, $p < .001$, 95% CI = [−0.50, −0.18]) and anger ($b_{[Model\ 4]} = -0.36$, $p < .001$, 95% CI = [−0.52, −0.20]).

Emotions as mediators

To examine emotions as mediators and evaluate consistency between different mediator methods, we ran regressions using both simultaneous and single mediator methods (see Table 2.1) based on existing research (Chua et al., 2012). The simultaneous mediator method examines the unique association between each emotion and openness whereas the single mediator method examines the association between each emotion and openness without controlling for the overlapping effects of the emotions on openness. The simultaneous mediator method comprises Models 5 and 8 whereas the single mediator method comprises Models 6, 7, 9, and 10. Controlling for self-control, we found that fatigue was not consistently significantly associated with openness (scale: $b_{[Model\ 5]} = 0.28$, $p = .002$, 95% CI = [0.10, 0.46]; $b_{[Model\ 6]} = 0.16$, $p = .085$, 95% CI = [−0.02, 0.33]; choice: $Exp(b)_{[Model\ 8]} = 1.59$, $p = .069$, 95% CI = [0.97, 2.61]; $Exp(b)_{[Model\ 9]} = 1.28$, $p = .276$, 95% CI = [0.82, 2.01]), but anger significantly negatively predicted openness (scale: $b_{[Model\ 5]} = -0.38$, $p < .001$, 95% CI = [−0.56, −0.21]; $b_{[Model\ 7]} = -0.29$, $p = .001$, 95% CI = [−0.47, −0.12]; choice[3]: $Exp(b)_{[Model\ 8]} = 0.53$, $p = .009$, 95% CI = [0.33, 0.86]; $Exp(b)_{[Model\ 10]} = 0.62$, $p = .027$, 95% CI = [0.41, 0.95]).

We then used Preacher and Hayes' (2008) bootstrapping method (repetition = 5000) to assess the significance of indirect associations via fatigue and anger using both simultaneous and single mediator methods. Table 2.1 presents all the results of indirect associations in Study 2. An indirect association between self-control and openness via decreased fatigue was not consistently significant (simultaneous: 95% $CI_{[scale]/[choice]}$ = [−0.19, −0.02]/[−0.40, 0.00]; single: 95% $CI_{[scale]/[choice]}$ = [−0.14, 0.01]/[−0.27, 0.07]). However, there was a consistent, significant indirect association between self-control and openness via anger (simultaneous: 95% $CI_{[scale]/[choice]}$ = [0.05, 0.24]/[0.05, 0.48]; single: 95% $CI_{[scale]/[choice]}$ = [0.02, 0.21]/[0.02, 0.38]). Therefore, our results replicated the findings of Study 1 and demonstrated that anger rather than fatigue consistently mediated the positive relationship between self-control and openness.

Study 3: coworker interaction

To extend Study 2′s findings on negative emotions, we investigated positive emotions as additional potential mediators of the relationship between trait self-control and openness in Study 3. Given that fatigue and anger represent low and high levels of negative emotions, respectively, we added serenity and attentiveness – positive emotions with low and high arousal, respectively (Pressman and Cohen, 2012) – as potential mediators. Although we propose that all emotions with a positive valence are related to openness, the results of Study 2 indicate that only the negative emotion with high arousal – anger – could consistently predict a low level of openness. Hence, a high emotional arousal may facilitate the consistent significant association between positive

[2] We indicate the odds ratio by taking the exponential of standardized regression coefficients to describe the associations between predictors and a binary outcome variable in logistic regression analyses.

[3] When an odds ratio or *Exp(b)* is less than 1, it describes a negative relationship between a predictor variable and an outcome variable (Szumilas, 2010). Thus, the results indicated a negative association between anger and openness.

Table 2.1
Regression Results and Indirect Effects in Study 2.

DV Predictors	Model 1 Openness Scale	Model 2 Openness Choice	Model 3 Fatigue	Model 4 Anger	Model 5 Openness Scale	Model 6 Openness Scale	Model 7 Openness Scale	Model 8 Openness Choice	Model 9 Openness Choice	Model 10 Openness Choice
Self-control	0.18*	1.55*	−0.34***	−0.36***	0.14	0.24**	0.08	1.41	1.69*	1.29
Fatigue					0.28**	0.16		1.59	1.28	
Anger					−0.38***		−0.29**	0.53**		0.62*
R^2	0.03		0.12	0.13	0.17	0.06	0.11			
Cox & Snell R^2		0.03						0.09	0.04	0.07
F	4.64*		17.40***	19.70***	8.97***	3.86*	8.07***			
χ^2		4.17*						12.83**	5.39	9.23**

Indirect Effect of Self-Control	Simultaneous Mediator Method				Single Mediator Method			
	DV: Openness Scale		DV: Openness Choice		DV: Openness Scale		DV: Openness Choice	
Mediator	*b*	95% CI	*B*	95% CI	*B*	95% CI	*B*	95% CI
Fatigue	−0.09	[−0.19, −0.02]	−0.16	[−0.40, 0.00]	−0.05	[−0.14, 0.01]	−0.09	[−0.27, 0.07]
Anger	0.14	[0.05, 0.24]	0.23	[0.05, 0.48]	0.11	[0.02, 0.21]	0.17	[0.02, 0.38]

Note: *$p < .05$; **$p < .01$; ***$p < .001$ (two-tailed). The letters "DV" refer to the term "dependent variable". All regression coefficients are standardized. For Models 2, 8, 9, and 10, we indicate the odds ratio (i.e., taking the exponential of standardized regression coefficients) to describe the associations between predictors and a binary outcome variable in logistic regression analyses. When an odds ratio is less than one, it indicates a negative association between a predictor variable and a dependent variable.

emotions and openness. To examine the role of emotional arousal in the association between positive emotions and openness, we examined attentiveness and serenity as separate mediators in Study 3. To replicate and extend the findings of Study 2 beyond a university sample, we examined working adults and assessed their emotions and interactions with their coworkers.

In addition, the observed relationship between trait self-control and openness may be attributable to trait empathy because empathy is positively associated with self-control (Tangney et al., 2004), positive emotions (Morelli et al., 2017), and openness (Song and Shi, 2017). Given the significant associations between empathy and the focal variables of Study 3 and the correlational nature of this study, we included trait empathy as a control variable to remove the overlapping effects of trait self-control and trait empathy on the outcome variables and therefore to examine unique relationships between trait self-control and the outcome variables.

Participants, design, procedures, and measures

Using Amazon's Mechanical Turk (MTurk), we recruited 271 working adults (46.49% female; age: $M = 38.45$, $SD = 10.39$; work experience: $M = 18.37$ years, $SD = 9.95$; 100% U.S. residents) who completed the study for monetary compensation ($1.22). Consistent with Study 1, we used a design involving an interval between the measure of trait empathy or trait self-control and other measures. Specifically, 394 participants during the first week completed the empathetic concern scale (4 items; $\alpha = 0.92$; 1 = strongly disagree; 7 = strongly agree) adapted from Ingoglia et al. (2016). A sample item included: "I often have tender, concerned feelings for people less fortunate than me." In addition, participants completed the same measure of trait self-control ($\alpha = 0.90$) as in Studies 1 and 2. We also screened participants who indicated that they were currently full-time employees and had at least one coworker at their workplace and 347 of the participants met our selection criteria.

During the second week, we invited these 347 participants to complete a second survey and 271 of them completed it. They indicated the initials of their coworker who had worked with them for the longest amount of time because the initials were used to provide information about evaluation targets in subsequent coworker assessments. We focused on coworkers who had worked with the participants for the longest amount of time because the evaluations of these coworkers would presumably be more likely to involve repeated observations than those of coworkers randomly selected by participants. Other researchers also used the same approach to study coworkers (Tsai et al., 2020). Participants read the instructions "Please consider a situation in which you and [Coworker's Initials] had different opinions" and indicated (1) the extent to which they typically felt various emotions based on their interactions with their coworker and (2) their levels of openness to alternative viewpoints from their coworker. The scales of emotions (1 = not at all; 7 = extremely) included fatigue ($\alpha = 0.93$), anger ($\alpha = 0.91$), attentiveness ($\alpha = 0.91$), and serenity ($\alpha = 0.96$). To measure fatigue and anger in Study 3, we employed the same emotion-related adjectives as those of the fatigue and anger scales used in Study 2. We also used the 4-item attentiveness scale and the 3-item serenity scale adapted from Watson and Clark (1994). The attentiveness and serenity items included "Concentrating/Alert/Attentive/Determined" and "Calm/Relaxed/At Ease," respectively. The openness scale was adapted from Studies 1 and 2 (e.g., I seriously considered the ideas [Coworker's Initials] proposed, $\alpha = 0.96$). Lastly, participants answered demographic questions.

Results and discussion

Separation between emotions

Comparative CFAs indicated that fatigue, anger, attentiveness, and serenity were four separate constructs. Fit statistics met acceptable criteria for the four-factor model: $\chi^2 = 155.63$, $df = 59$, $p < .001$, $CFI = 0.97$, $SRMR = 0.04$. A chi-square difference test confirmed that the four-factor model was significantly better than the one-factor, two-factor, and three-factor models (all $ps < 0.001$).

Self-control as a predictor

We used the same approach (i.e., standardizing the variables in the regression models) as in Studies 1 and 2 and OLS regression analyses to examine trait self-control as a predictor of other variables. To examine the unique associations between trait self-control and other variables and to maintain a consistent statistical analysis between Study 3 and the first two studies, we conducted the regression analyses with and without trait empathy as a control variable in Tables 2.2a and 2.2b, respectively. Self-control was significantly positively associated with openness ($b_{[\text{Model 1:with control/without control}]} = 0.19/0.23$, $p = .001/< 0.001$, 95% CI = [0.08, 0.31]/ [0.12, 0.35]), attentiveness ($b_{[\text{Model 4:with control/without control}]} = 0.12/0.19$, $p = .030/0.002$, 95% CI = [0.01, 0.24]/ [0.07, 0.31]), and serenity ($b_{[\text{Model 5:with control/without control}]} = 0.27/0.29$, $p < .001/0.001$, 95% CI = [0.15, 0.38]/[0.17, 0.40]), and significantly negatively associated with fatigue ($b_{[\text{Model 2:with control/without control}]} = -0.38/-0.40$, $p < .001/0.001$, 95% CI = [−0.49, −0.27]/ [−0.51,

Table 2.2a
Regression Results and Indirect Effects with Trait Empathy as a Control Variable in Study 3.

DV / IV	Model 1 Openness	Model 2 Fatigue	Model 3 Anger	Model 4 Attentiveness	Model 5 Serenity	Model 6 Openness	Model 7 Openness	Model 8 Openness	Model 9 Openness	Model 10 Openness
Empathy	0.22***	−0.11*	−0.02	0.36***	0.12	0.05	0.18**	0.21***	0.01	0.16**
Self-control	0.19**	−0.38***	−0.33***	0.12*	0.27***	−0.02	0.06	0.03	0.12*	0.05
Fatigue						−0.08	−0.36***			
Anger						−0.26***		−0.50***		
Attentiveness						0.39***			0.58***	
Serenity						0.18**				0.55***
R^2	0.10	0.18	0.11	0.16	0.10	0.52	0.21	0.32	0.39	0.37
F	15.29***	28.53***	16.79***	25.17***	14.17***	48.26***	23.46***	42.34***	56.58***	53.24***

Indirect Effect of Self-Control on Openness	Simultaneous Mediator Method		Single Mediator Method	
Mediator	*b*	95% CI	*b*	95% CI
Fatigue	0.03	[−0.02, 0.09]	0.14	[0.07, 0.22]
Anger	0.09	[0.03, 0.15]	0.16	[0.10, 0.23]
Attentiveness	0.05	[0.01, 0.09]	0.07	[0.02, 0.14]
Serenity	0.05	[0.01, 0.10]	0.15	[0.08, 0.22]

Note: *$p < .05$; **$p < .01$; ***$p < .001$ (two-tailed). All regression coefficients are standardized.

Table 2.2b
Regression Results and Indirect Effects without Trait Empathy as a Control Variable in Study 3.

DV / IV	Model 1 Openness	Model 2 Fatigue	Model 3 Anger	Model 4 Attentiveness	Model 5 Serenity	Model 6 Openness	Model 7 Openness	Model 8 Openness	Model 9 Openness	Model 10 Openness
Self-control	0.23***	−0.40***	−0.33***	0.19**	0.29***	−0.02	0.08	0.07	0.12*	0.07
Fatigue						−0.09	−0.38***			
Anger						−0.26***		−0.50***		
Attentiveness						0.41***			0.59***	
Serenity						0.18**				0.57***
R^2	0.05	0.16	0.11	0.04	0.08	0.52	0.18	0.28	0.39	0.35
F	15.46***	52.43***	33.58***	9.76**	24.28***	57.67***	28.81***	51.69***	85.12***	72.14***

Indirect Effect of Self-Control on Openness	Simultaneous Mediator Method		Single Mediator Method	
Mediator	*b*	95% CI	*b*	95% CI
Fatigue	0.04	[−0.02, 0.10]	0.15	[0.09, 0.24]
Anger	0.09	[0.03, 0.15]	0.17	[0.10, 0.24]
Attentiveness	0.08	[0.03, 0.13]	0.11	[0.05, 0.17]
Serenity	0.05	[0.004, 0.104]	0.16	[0.10, 0.24]

Note: * $p < .05$; ** $p < .01$; *** $p < .001$ (two-tailed). All regression coefficients are standardized.

−0.29]) and anger ($b_{[\text{Model 3:with control/without control}]} = -0.33/-0.33, p < .001/0.001$, 95% CI = [−0.44, −0.21]/[−0.45, −0.22]).

Emotions as mediators

Using trait self-control and four emotions as predictors of openness, we found that fatigue was not consistently significantly associated with openness (simultaneous: $b_{[\text{Model 6:with control/without control}]} = -0.08/-0.09, p = .131/0.110$, 95% CI = [−0.19, 0.02]/ [−0.19, 0.02]; single: $b_{[\text{Model 7:with control/without control}]} = -0.36/-0.38, p < .001/0.001$, 95% CI = [−0.48, −0.24]/[−0.50, −0.26]). However, anger was significantly negatively associated with openness (simultaneous: $b_{[\text{Model 6:with control/without control}]} = -0.26/-0.26, p < .001/0.001$, 95% CI = [−0.38, −0.15]/ [−0.37, −0.14]; single: $b_{[\text{Model 8:with control/without control}]} = -0.50/-0.50, p < .001/0.001$, 95% CI = [−0.60, −0.39]/ [−0.61, −0.39]). Furthermore, attentiveness was significantly positively associated with openness (simultaneous: $b_{[\text{Model 6:with control/without control}]} = 0.39/0.41, p < .001/0.001$, 95% CI = [0.28, 0.50]/ [0.30, 0.51]; single: $b_{[\text{Model 9:with control/without control}]} = 0.58/0.59, p < .001/0.001$, 95% CI = [0.48, 0.69]/[0.49, 0.68]). Serenity was also significantly positively associated with openness ($b_{[\text{Model 6:with control/without control}]} = 0.18/0.18, p = .003/004$, 95% CI = [0.06, 0.30]/[0.06, 0.30]; single: $b_{[\text{Model 10:with control/without control}]} = 0.55/0.57, p < .001/0.001$, 95% CI = [0.45, 0.65]/ [0.47, 0.67]).

We used the same approach as in Study 2 to assess indirect effects (see Table 2.2). The results did not demonstrate consistently significant indirect associations between self-control and openness via decreased fatigue (simultaneous: 95% $CI_{[\text{with control/without control}]}$ = [−0.02, 0.09]/ [−0.02, 0.10]; single: 95% $CI_{[\text{with control/without control}]}$ = [0.07, 0.22]/ [0.09, 0.24]). However, there were significant positive indirect associations between self-control and openness via decreased anger (simultaneous: 95% $CI_{[\text{with control/without control}]}$ = [0.03, 0.15]/[0.03, 0.15]; single: 95% $CI_{[\text{with control/without control}]}$ = [0.10, 0.23]/[0.10, 0.24]), increased attentiveness (simultaneous: 95% $CI_{[\text{with control/without control}]}$ = [0.01, 0.09]/[0.03, 0.13]; single: 95% $CI_{[\text{with control/without control}]}$ = [0.02, 0.14]/[0.05, 0.17]), and increased serenity (simultaneous: 95% $CI_{[\text{with control/without control}]}$ = [0.01, 0.10]/[0.004, 0.104]; single: 95% $CI_{[\text{with control/without control}]}$ = [0.08, 0.22]/[0.10, 0.24]). Therefore, the results of Study 3 replicated the significant findings of Study 2 and demonstrated that anger, attentiveness, and serenity mediated the association between self-control and openness during an interaction with a coworker. These findings were consistent between the analyses that included and excluded trait empathy as a control variable.

General discussion

Across three studies, we found a significant positive association between trait self-control and openness to alternative viewpoints. To clarify this process, we investigated various emotions as mediators and found that the positive association between self-control and openness was consistently mediated by decreased anger – but not fatigue – and increased emotions with positive valence: attentiveness and serenity. Our results illuminate the relative importance of various emotions in

mediating the relationship between self-control and openness. The results also implicate the reduced anger rumination and goal balance models of self-control: individuals with higher trait self-control may significantly inhibit impulsive responses, such as anger, and perform effective goal management leading to positive emotions, and thus respond more openly to others' perspectives.

Theoretical implications

Our findings contribute to the literature on the determinants of openness. Previous research has identified various factors that positively influence openness to alternative suggestions, such as perspective-taking training (Sessa, 1996) and engagement in deliberative dialog rather than advocation of an agenda (Garvin and Roberto, 2001). Whereas these studies offered different methods to promote openness, our research investigated a personality trait and emotions as predictors of openness. Specifically, our research is the first attempt to explore the positive association between trait self-control and openness to alternative viewpoints via both negative and positive emotions.

An exploration of trait self-control as a predictor of openness to alternative viewpoints illuminates whether self-control processes involve an emphasis on one's own preferences or on others' preferences. There is a substantial debate in the existing research regarding the direction of the relationship between deliberative control (over intuition) and prosocial behavior (reviewed in Rand, 2016). Some research demonstrates that people with high self-control tend to suppress reciprocity considerations and therefore maximize personal benefits (Halali et al., 2014). Other research indicates that self-control decreases self-centered monetary concerns (Achtziger et al., 2016). To reconcile the inconsistent associations between self-control and an emphasis on others' preferences, researchers have identified boundary conditions for such associations. For instance, trait self-control is more positively associated with prosocial behavior when individuals consider social relations to be more interdependent (Uziel and Hefetz, 2014). Our research demonstrates a positive association between trait self-control and openness to alternative perspectives from others, which implicates a positive relationship between self-control and prosocial behavior. Participants in our studies may consider their relationship with their partners as interdependent. To verify this possibility, future research can investigate the extent to which relationship interdependence moderates the association between self-control and openness.

In addition, past research used fatigue as a single mediator for the effects of induced self-control depletion (Yam et al., 2014). The present approach broadens our understanding of the emotional mediation process from a single type of emotion with negative valence and low arousal (i.e., fatigue) to emotions with different types of valence and levels of arousal (i.e., fatigue, anger, attentiveness, and serenity). We found that both anger and emotions with positive valence, attentiveness and serenity, significantly predicted openness, which suggests that approach-related emotions (in contrast to avoidance-related emotions) may be associated with openness. People experiencing anger or positive emotions may be more motivated to approach and resolve their current problems (Carver and Harmon-Jones, 2009). To manage opinion differences in a task, angry individuals may reject dissenting opinions whereas those with positive emotions may consider dissenting opinions.

Furthermore, our research complements and extends recent work indicating that having one's ego depleted can decrease openness to dissent via increased anger (Tsai and Li, 2020). The current work indicates that such openness may also decrease because individuals with less trait self-control may frequently recall thoughts about their angry experiences and thus feel higher levels of anger. Consistent with our findings, angry individuals are highly motivated to overcome their social obstacles and work toward their aspirations (Campos et al., 1989), such as by dominating another person's behavior rather than accepting others' suggestions (Fischer and Roseman, 2007). Moreover, our findings suggest decreased levels of positive emotions as alternative processes of how ego depletion manipulations may reduce openness.

Practical implications

Our work has novel practical implications for the association between self-control interventions and openness. Existing interventions have been proposed for avoiding the adverse effects of limited self-control based on fatigue. For instance, sufficient sleep (e.g., Baumeister and Heatherton, 1996), and an increased recovery time (e.g., a long rest period between tasks, Oaten et al., 2008; Tyler and Burns, 2008) were proposed to reduce fatigue caused by limited self-control. By contrast, our findings suggest that people should decrease anger and increase positive emotions to mitigate the negative effects of limited self-control on openness. To enhance positive emotions and reduce anger, individuals can engage in mindfulness training (i.e., non-judgmental concentration on the present moment, Amutio et al., 2014), meditation practices (Rosenberg et al., 2015), and anger management programs (Sanderfer and Johnson, 2015). By doing so, individuals with limited self-control may remain open to alternative perspectives during situations with dissenting opinions.

Limitations and future research

Our research is not without limitations, which in turn present opportunities for future research. First, the current measure of trait self-control had a narrow focus on behavioral inhibition (Katzir et al., 2021), a restricted emphasis on self-reported capacity rather than motivational processes of self-control (Grund and Carstens, 2019), and mixed findings regarding the most preferable factor structure of the measure (Manapat et al., 2019). Second, we did not measure trait agreeableness or openness and thus could not conclude whether trait self-control would significantly predict openness to alternative viewpoints while controlling for trait agreeableness and openness. Different aspects of self-control have also been found to be associated with trait agreeableness (e.g., Krueger et al., 1996; Hoyle and Davisson, 2016) or trait openness (e.g., Elfhag and Morey, 2008; Hoyle and Davisson, 2016). Third, we studied four emotions with different valences and levels of arousal but did not measure other crucial emotions, including fear, sadness, or happiness. Fourth, we did not preregister our studies, which would have allowed full confidence in the a priori nature of our hypotheses. To address these weaknesses, researchers can use recent assessments of self-control (e.g., Bürgler et al., 2022; Milyavskaya et al., 2021), include relevant trait measures as controls, examine other emotions as alternative mediators, and engage in preregistration in subsequent studies.

Moreover, although the consistent associations observed across three studies using time-lagged methods suggest causal relationships, longitudinal studies are needed to capture real-life situations and strengthen causal inferences in the current research. Specifically, given that emotions often fluctuate over time and may differ in various events with dissenting opinions, future research can also use an experience sampling study that involves observational reports on emotions and openness to alternative viewpoints on multiple occasions over time. Subsequent studies with repeated measures would also allow researchers to examine the causality of the mediation effects proposed in the present investigation (Cole and Maxwell, 2003).

Given the inconsistent associations between fatigue and openness, researchers can examine moderators of the associations. For instance, previous research has demonstrated that the association between fatigue and unethical behavior depends on the level of social consensus over the unethicality of the behavior, such as cheating for a small reward (Yam et al., 2014). Specifically, fatigue is negatively associated with a potentially immoral behavior when people believe that a majority of others consider the behavior unacceptable. However, the negative association disappears when people believe that only a minority of others consider the immoral behavior unacceptable. Yam et al.'s results suggest

that fatigue may be more likely to influence behavior when an individual faces greater social pressure to conform. Future research may wish to examine whether the negative association between fatigue and openness to alternative viewpoints is greater if a larger group of people unanimously oppose the individual's opinion.

Although both attentiveness and serenity are positively associated with openness, future research can investigate the distinctive processes regarding the relationships between these two positive emotions and openness. For instance, attentiveness is associated with task engagement (Watson and Tellegen, 1985) and prevention of errors (Weick and Roberts, 1993) whereas serenity is associated with a tendency to appreciate the current circumstances and integrate them into new priorities (Fredrickson, 2013). These behavioral tendencies may serve as different reasons why attentiveness and serenity are positively associated with openness.

Conclusion

A failure to be open to others' perspectives in situations with dissenting opinions can cause severe negative consequences for economic outcomes and interpersonal dynamics. Our research has suggested that a significant precursor of open-minded responses to others' alternative viewpoints is the extent to which an individual has trait self-control. Furthermore, we found that trait self-control predicts lower fatigue and anger and higher attentiveness and serenity, but only anger and positive emotions are consistently associated with openness. To our knowledge, our research is the first investigation of the association between trait self-control and openness via the four emotions. Our results elucidate the associations between trait self-control and social interactions and offer novel perspectives on why people are receptive to others' dissenting opinions.

Data code statement

The study materials, datasets, and analytic codes can be accessed at the link (https://osf.io/pyubg/?view_only=294728bd21464fab96301b02b6aa734c).

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

We have shared the link to our data/code.

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