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The impact of expressive flexibility and self-control on moral competence following exposure to simulated combat-like environments in 18-22-year-old U.S. Military recruits

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Abstract
The impact on moral competence following exposure to combat-like environments can be found in extant soldier narratives, however, limited scientific research has addressed such effects. Moreover, the influence of one's expressive flexibility and self-control on moral competence following combat-like environments is unknown. Employing a univariate design, this study recruited 107 participants aged 18 to 22 from a private US military university to examine the impact on moral competence, including the potential moderating effects of expressive flexibility and self-control, following exposure to combat-like environments. To simulate combat-like environments, participants were placed in either immersive (Bravemind) or non-immersive (Virtual Battlespace 3) virtual environments. Self-reported expressive flexibility, self-control, and moral competence were assessed. The results revealed that following exposure to combat-like environments, individuals' moral competence increased. A main effect of self-control on moral competence indicated that individuals' self-control directly affects their moral competence. Findings from this study offer a richer comprehension of how, following simulated combat environments, moral competence can be influenced, and how expressive flexibility and self-control can aid in protecting mental health and well-being, even when judging moral dilemmas.

Keywords: Moral competence, simulation, expressive flexibility, self-control, military

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Introduction

Combat-like environments continue to generate moral and ethical challenges. Both military personnel and civilians must address moral dilemmas and conflicts effectively and efficiently; for example, a soldier must decide to either use violence to protect themself or save an adversary while maintaining peer trust and protecting human rights. To meet such challenges successfully, people must possess moral competence (van Baarle, Bosch, Widdershoven, Verweij, & Molewijk, 2015; van Baarle & Bosch, 2011). Moral competence is "the affective orientation to perform altruistic behaviors toward others and the ability to judge moral issues logically, consistently, and at an advanced level of development" (Ma, 2012). Better assessing how combat-like environments impact moral competence is critical not only to understanding how people perform on facing moral challenges but also to supporting physical and mental well-being, especially as these environments have been shown to produce mental illnesses such as depression and post-traumatic stress disorder (Agaibi & Wilson, 2005).

As the US has, and continues to be, exposed to a variety of adverse and violent acts on its own soil, empirically assessing and investigating the impact of combat-like environments on moral competence is essential. Combat-like environments place individuals in dilemmas that require decision-making and judgment of what is right or wrong, what is beneficial or risky, and what is ethical or unethical (Kim & Kim, 2013). Facing these moral dilemmas and conflicts necessitates the capacity for moral competence; specifically, individuals must make decisions and act in an altruistic manner, while consequently assessing their own character and behavior through a moral lens (van Baarle & Bosch, 2011). The moral judgments and decisions made in these

adverse contexts subsequently impact individual well-being, as well as military operations' success and mission effectiveness (Thompson & Jetly, 2014).

While soldiers' anecdotes have previously highlighted the impact of combat-like environments on moral competence, there is still a need to assess this impact through a scientific evaluation. The limited research in this field has revealed how combat-like environments negatively impact the capacity for successful moral navigation (Lind, 2008; van Baarle et al., 2015; van Baarle & Bosch, 2011). However, none of these previous studies has assessed whether moral competence is influenced by expressive flexibility and self-control—two constructs that are vital in defining human performance and character. Expressive flexibility is the capacity to enhance emotions (i.e., to demonstrate improved and heightened potential emotional expression) and suppress emotions (i.e., the capacity to demonstrate reduced and repressed potential emotional expression) (Bonanno & Burton, 2013), while self-control is the capacity to regulate attention, behavior, and emotions despite countervailing temptation (Duckworth, Taxer, Eskreis-Winkler, Galla, & Gross, 2019).

As our armed forces are subjected to combat-like environments, a focus must be placed on evaluating expressive flexibility and self-control as they are key protective factors in individual well-being; the value of comprehending these constructs is incalculable, as these adverse contexts and situations can produce permanent physiological and psychological wounds (Chen, Chen, & Bonanno, 2018; Westphal, Seivery, & Bonanno, 2010). It can then be hypothesized that if expressive flexibility and self-control are essential constructs in overcoming the negative impact of adverse environments, then these two constructs could also affect moral competence, an integral competency for effective military performance and mission success.

An individual with high moral competence must have the mental capacity to assess how collectively recognized moral values (e.g., social progress, human dignity, equal rights) influence individual actions, behavior, and motives (Ma, 2012). With a high degree of moral competence, an individual can address dilemmas and conflicts following such universally accepted moral principles instead of resorting to raw power (Kim & Kim, 2013). Additionally, an individual with high moral competence can adhere to previously universally accepted moral values, recognize the moral dimension of any situation, and identify which of those principles are in jeopardy in efforts to assess moral conflicts adequately. However, while there are collectively recognized moral values, context can encourage and influence these moral values and ethical principles (van Baarle et al., 2015). For example, in a combat environment, the use of aggression (which contradicts an already collectively recognized moral value) is more likely to be tolerated in this context than in a non-combat environment. Military personnel, especially those who are exposed to such environments, are typically faced with assessing what is morally wrong or right after the context is taken into account.

Moral competence plays a crucial role in successful military operations and leadership effectiveness (Kim & Kim, 2013). For example, a soldier must direct a team through morally challenging contexts during militant acts, and morally challenging situations demand moral competence to execute ethically sound decisions (de Graaff, de Vries, van Bijlevelt, & Giebels, 2017). Such ethically demanding contexts require individuals who possess moral competence to effectively face and cope with these dilemma-charged and value-burdened situations through recourse to objectivity, impartiality, and a sense of justice (van Baarle et al., 2015). With such high and far-reaching consequences, especially in combat-like environments, soldiers must be morally competent as a lack of such competence can lead to risky and potentially life-threatening contexts that have significant humanitarian, operational, or political effects on the community, public, or individual well-being (de Graaff et al., 2017). In particular, a soldier must decide to either harm an enemy in allegiance to their country, or save an enemy from death without prejudice, and these decisions must align with universally accepted moral principles.

Van Baarle et al. (2015) revealed that addressing moral dilemmas openly is more complex in a military context. As such, individuals in such adverse environments face extremely demanding and challenging moral conflicts during combat, as they must make decisions about how to adhere to their military training and their principles and values (van Baarle & Bosch, 2011). In particular, Asencio, Byrne, and Mujkic (2017) showed that the US military has incorporated moral competence in its current ethics training while de Graaff et al. (2017) reported that the Royal Netherlands Army has classified moral competence as a critical moral character trait necessary for mission success and effective military development. Comparable to previous research, the current project explores individuals' moral competence following exposure to a combat-like environment. However, this study broadens the current corpus by investigating how individuals' expressive flexibility and self-control impact these outcomes.

Expressive flexibility and self-control have, historically, been critical elements in successful psychological adjustment and health (Aldao, Sheppes, & Gross, 2015; Bonanno & Burton, 2013; Chen et al., 2018). First, individuals who are high in expressive flexibility can enhance emotions (i.e., to demonstrate improved and heightened potential emotional expression) and also suppress emotions (i.e., to demonstrate reduced and repressed potential emotional expression) (Chen et al., 2018). In both expressive enhancement and suppression abilities, context and situation are critical. Second, individuals who are high in self-control can regulate emotion, attention, and behavior regardless of being otherwise tempted or enticed (Duckworth et al., 2019; Tangney, Baumeister, & Boone, 2004). Expressive flexibility and self-control are integral to successful

adaptation and acclimation to adverse situations and contexts. For example, research has shown that greater levels of expressive flexibility have been shown to function as a barrier against trauma and stressors (Rodin et al., 2017) by supporting psychopathology (Aldao et al., 2015; Rodin et al., 2017), mental health (Aldao et al., 2015), and psychological adjustment (Bonanno & Burton, 2013). About self-control, research has shown that higher levels of self-control have been shown to predict reduced post-traumatic stress disorder symptoms (Walter, Gunstad, & Hobfoll, 2010) including depression (Dombrovski et al., 2012), improved psychopathology (Tangney et al., 2004), and positive health behaviors (Melanko & Larkin, 2013).

Expressive flexibility and self-control are essential elements in successful psychological adjustment and health (Aldao et al., 2015; Chen et al., 2018; Westphal et al., 2010). In particular, the ability of expressive flexibility, both in expressive suppression and in expressive enhancement, including the capacity for self-control, is critical for successful acclimation and adaptation to adverse contexts and situations. For example, research has shown that higher levels of expressive flexibility have been shown to support mental health (Aldao et al., 2015), improved psychopathology (Rodin et al., 2017), and psychological adjustment (Aldao et al., 2015; Westphal et al., 2010), whereas lower levels of expressive flexibility have been associated with enduring emotional, cognitive, social, and health costs (Bonanno et al., 2007; Westphal et al., 2010), and decreased well-being (Aldao et al., 2015; Chen et al., 2018). Furthermore, research has shown that greater levels of self-control have been shown to sustain life satisfaction and well-being (Hofmann, Luhmann, Fisher, Vohs, & Baumeister, 2014), predict achievement, positive affect (Choi, Lim, Catapano, & Choi, 2018), and positive life outcomes (Duckworth et al., 2019).

While previous studies have assessed the importance of expressive flexibility and self-control, no other studies have examined the impact of expressive flexibility and self-control on moral competence following exposure to simulated combat-like environments. Two constructs that have been shown to help individuals persist during and following adverse environments—expressive flexibility and self-control—were thus chosen for the current study. Based on their role in supporting successful adjustment, expressive flexibility and self-control might mitigate moral competence following combat-like contexts. In efforts to complete this work, immersive and non-immersive technologies were utilized to simulate combat-like environments.

The US Army has implemented numerous immersive and non-immersive technologies to train soldiers on how to perform in the field (Department of the Army [DA] ADP 7-0; Kim, Rosenthal, Zielinski, & Brady, 2014). Immersive technologies allow an individual to be fully immersed in a simulated environment through tactile, auditory, and visual apparatus such as head-mounted tracking systems, vibrating floorboards, and body sensors. Non-immersive technologies allow an individual to participate in a simulated environment in a less immersive fashion, through the use of a video screen and controller (Kim et al., 2014).

Research has shown that immersive and non-immersive technologies can induce real-world affects and physiological arousal (Kim et al., 2014; Tamborini, Eastin, Skalski & Lachlan, 2004). Ivory and Kalyanaraman (2009) revealed that participants who were engaged in the immersive simulation reported more emotionality than participants in the non-immersive simulation. Tamborini et al. (2004) revealed that participants in an immersive condition exhibited more aggressive feelings than participants in a non-immersive condition. Additionally, recent work has evaluated these technologies as a medium in the treatment of mental health and cognitive disorders; clinical research has shown great promise in treating problems (Kim et al., 2014; Maples-Keller, Bunnell, Kim, & Rothbaum, 2017). However, due to the potential for re-traumatization and in-depth training, such technologies can be disadvantageous (Maples-Keller et al., 2017). While not the main focus of this endeavor, this current research will add to the recent work by investigating the impact of immersiveness and simulation on moral competence.

Method

Participants

A total of 107 participants (66% men and 34% women) were drawn from a private military institution; while the gender ratio was not balanced, this is, however, a true depiction of the ratio of gender at this private US military university. Over a third of the participants aged 18–22 were either 18 (34%) or 19 (38%); 40% were freshmen and 34% were sophomores. Individuals with previous combat/military experience, 17 years or younger, and/or sensitive to immersive and non-immersive technologies were excluded from the study.

Software and Materials

Bravemind and Virtual Battlespace 3 (VBS3)

The two simulators utilized in this study were Bravemind and Virtual Battlespace 3 (VBS3). Bravemind is an immersive virtual reality (VR) system that simulates Iraqi environments; stimuli include improvised explosive devices (IEDs) and missile and gunfire sounds. Users wear a head-mounted display system which orients them within the simulation and utilizes a video game controller to move around the simulation. A vibrotactile floorboard, Rumblefloor, is utilized to simulate the combat environment vibrations. Virtual Battlespace 3 is a

first-person military training non-immersive simulation; it simulates combat scenarios and is utilized for tactical training and mission rehearsal. Participants used a standard laptop, a keyboard, a mouse, and headphones.

Moral Competence Test (MCT) (Lind, 2008)

The 26-item MCT was the first (self-report) scale administered. The MCT assesses a person's capability to evaluate contentious and morally problematic statements through the use of two moral dilemmas (i.e., one with labor workers and one with doctors) in relation to moral orientations and principles, instead of personal opinion, about the moral dilemma. The participant is tasked to rate these statements on a Likert-type scale from "I strongly reject" (−4) to "I strongly accept" (+4). The MCT revealed a high test–retest correlation (r = .90) (Lind, 2008).

The Flexible Regulation of Emotional Expression (FREE) Scale (Bonanno & Burton, 2013)

The 16-item FREE scale was the second (self-report) scale administered. The FREE scale assesses an individual's capacity to enhance and suppress displayed emotion within a variety of hypothetical contexts. The FREE scale is broken down into four categories: (a) enhancing positive emotion; (b) enhancing negative emotion; (c) suppressing positive emotion; and (d) suppressing negative emotion. Items include "The following scenarios involve NEGATIVE emotion. For each scenario, indicate how well you would be able to be even MORE EXPRESSIVE than usual of how you were feeling: You're attending the funeral of someone you don't know" and "The following scenarios involve POSITIVE emotion. For each scenario, indicate how well you would be able to CONCEAL how you were feeling: You are in a training session and you see an accidentally funny typo in the presenter's slideshow." Findings from Bonanno and Burton (2013) revealed the frequency of cognitive reappraisal (α = .87) and expressive suppression (α = .79).

The Brief Self-control Scale (BSCS) (Tangney et al., 2004)

The 10-item BSCS was the third (self-report) scale administered. This BSCS assesses dispositional self-regulatory behavior in four facets: thoughts, performance, emotions, and impulses. Items include "I get distracted easily" and "I'm good at resisting temptation." The BSCS showed internal reliability (α = .85) and test–retest reliability (α = .87) (Tangney et al., 2004).

Design

Participants were placed in one of four conditions: Bravemind with simulated combat (n = 27) or non-combat (n = 27) or VBS3 with simulated combat (n = 26) or non-combat (n = 27). Individuals in the simulated combat conditions drove on an Iraqi desert road while being exposed to IEDs, missiles and gunfire. Individuals in the simulated non-combat scenario completed the same scenario, but were not exposed to the combat stimuli. While participants utilized one of the two software programs, the VBS3 scenario mirrored the Bravemind scenario. Participants completed comparable scenarios which allowed for the comparison of the software.

Hypotheses

This research is based on the following hypotheses:

1. Individuals in the immersive simulated conditions would be more morally competent than individuals in the non-immersive conditions.
2. Individuals who are high in expressive flexibility and self-control would present as being more morally competent than individuals who are low in expressive flexibility and self-control, suggesting that expressive flexibility and self-control will offset the effects of adverse environments.

Procedure

The study was approved by Teacher's College, Columbia University's Institutional Review Board. Volunteers were recruited by word of mouth and received extra credit. Data collection was conducted over two weeks. For the first part of the study, participants took part in one of the conditions for ten minutes and the block randomization method was used to confirm an equal sample size for conditions. Participants were then asked to complete the MCT. There was no time restriction to complete the MCT. A week after completing the first part of the study, participants received a Qualtrics link to complete the scales, the FREE and BSCS. Participants were also asked about their age, gender, and major, including their experience with the software.

Results and Discussion

Two univariate ANOVAs were utilized to assess how moral competence was impacted following exposure to combat-like environments simulated by non-immersive and immersive technologies, and consequently, how expressive flexibility and self-control mediated the impact of these combat-like environments. For power analysis, G*Power 3.1.9.2 was employed to provide a sample size of 108 participants for medium-sized effects (Cohen's f = .32) with acceptable statistical power (Faul, Erdfelder, Buchner, & Lang, 2009).

Pearson product-moment correlation coefficients were utilized to investigate the relationships between the constructs (see Table 1). Findings revealed that expressive flexibility and self-control were significantly correlated with one another (r = .23, p = .016); however, expressive flexibility and moral competence were not significantly associated with one another (r = .08, p = .44, *NS*). Results did reveal a significant relationship between self-control and moral competence (r = .43, p < .001). Participants self-reported as highly self-controlled (M = 4.47, SD = 0.48), and moderately flexible in the regulation of emotional expression (M = 11.99, SD = 1.77). There were no significant differences in terms of gender and expressive flexibility (t (105) = 0.45, p = .66, *NS*) or self-control (t (105) = 0.18, p = .86, *NS*). Additionally, there were no significant differences in terms of age and expressive flexibility (F (4, 102) = 1.07, p = .37, *NS*) or self-control (F (4, 102) = 1.10, p = .36, *NS*).

Table 1 Correlational Matrix of Study Measures

	1	2	3	4	5	6	7	8
1. Age	1							
2. Gender	−0.01	1						
3. Class Year	−0.87***	0.02	1					
4. Simulation	−0.11	0.11	0.05	1				
5. Immersiveness	−0.09	0.03	0.13	−0.01	1			
6. Moral Competence	−0.09	0.03	0.07	0.58***	−0.06	1		
7. Self-control	−0.01	−0.02	0.04	0.52***	0.01	0.43***	1	
8. Expressive Flexibility	0.05	0.04	−0.01	0.16	0.05	0.08	0.23*	1

* = p < .05, ** = p < .01, *** = p < .001

Table 2 Tests of Between-subjects Effects on Moral Competence

	Type III SS	df	MS	F	η_p^2
Self-control	261.73	1	261.73	3.83*	0.04
Expressive Flexibility	36.66	1	36.66	0.54	0.01
Simulation	1853.83	1	1853.83	27.14***	0.21
Immersiveness	25.93	1	25.93	0.54	0.01
Simulation * Immersiveness	19.71	1	19.71	0.38	0.01
Simulation * Immersiveness * Self-control	506.78	4	126.70	1.84	0.07
Simulation * Immersiveness * Expressive Flexibility	208.25	4	52.06	0.76	0.03

* = p < .05, ** = p < .01, *** = p < .001

Simulation and Immersiveness on Moral Competence

Significant results revealed a main effect of simulation on moral competence (F (1, 101) = 26.49, p < .001, η_p^2 = 0.21). Participants who took part in the simulated combat conditions (M = 24.63, SD = 10.15) performed better on moral competence than participants who took part in the simulated non-combat conditions (M = 13.10, SD = 5.79) (see Table 2). The findings show that exposure to simulated combat-like environments positively influenced individuals' moral competence following immersion in simulated combat-like environments. Furthermore, findings revealed no main effect of immersiveness on moral competence (F (1, 101) = .58, p = .48, η_p^2 = .01, *NS*) (see Table 2). The results suggest that immersiveness did not positively or negatively impact individuals' moral competence.

Expressive Flexibility and Self-control on Moral Competence

Results showed a main effect of self-control on moral competence ($F(1, 101) = 3.83$, $p = .05$, $\eta_p^2 = .04$), suggesting that self-control positively influenced participants' moral competence (see Table 2). However, unlike self-control, the findings revealed no main effect of expressive flexibility on moral competence ($F(1, 101) = 0.54$, $p = .47$, $\eta_p^2 = .010$, *NS*) (see Table 2).

Expressive Flexibility and Self-control × Simulation × Immersiveness on Moral Competence

Findings revealed no significant three-way interaction between self-control, simulation, and immersiveness, ($F(4, 98) = 1.84$, $p = 0.13$, $\eta_p^2 = .07$, *NS*) or expressive flexibility, simulation, and immersiveness ($F(4, 98) = 0.76$, $p = .56$, $\eta_p^2 = 0.03$, *NS*) (see Table 2). These findings mean that the effect of one variable on the response does not depend on the levels of the other two variables. In other words, there is no interaction between the three variables that would affect the outcome of the study directly. This means that the effects of each variable can be considered independently, without considering the effects of the other variables.

Adverse environments such as combat-like environments often generate moral dilemmas and conflicts that individuals are challenged to confront. This study serves as one of the first scientific studies to assess how adverse environments and an individual's self-control and expressive flexibility impact their moral competence following exposure to simulated combat environments. While anecdotal evidence from soldier narratives has shown how combat-like environments continue to produce moral challenges, which in turn, necessitate those military personnel and civilians alike to assess and judge moral dilemmas, empirical work must be conducted. A better understanding of how combat-like environments impact moral competence is important not only to assess individuals' moral competence following exposure to simulated combat environments but also in supporting mental and physical well-being (Agaibi & Wilson, 2005). Additionally, evaluating the influence of self-control and expressive flexibility on moral competence adds to the current literature on positive psychology.

The value of comprehending the impact of self-control and expressive flexibility on moral competence is incalculable as these constructs are integral factors in fostering mentally healthy individuals, shaping positive human performance, and promoting protective mechanisms that shield individuals from adverse environments (Aldao et al., 2015; Dombrovski et al., 2012; Rodin et al., 2017; Tangney et al., 2004; Walter et al., 2010). As most individuals are exposed to some sort of life-threatening experience at some point in their life, we must examine these positive psychology constructs further following exposure to adverse environments (Bonanno & Burton, 2013). This study found a significant relationship between self-control and moral competence and suggests the possible relevance of expanding self-control research and further investigating the impact of self-control on moral competence.

Additionally, as both military and civilians continue to be exposed to adverse contexts and situations, studies like this one can help show how self-control can impact moral competence which can help individuals who are placed in dilemmas that require moral decision-making and judgment. Furthermore, as these moral judgments and decisions made in these adverse contexts impact individual well-being, as well as military operations' success and mission effectiveness, it is important that we better understand constructs that can safeguard mental health (Thompson & Jetly, 2014). While expressive flexibility did not impact moral competence, more work looking into such constructs is essential as they are critical protective factors linked with a reduced likelihood of problematic outcomes.

Lastly, as VR technologies become more accessible in US military training, there is a need to better understand the impact of VR technologies on behavior and performance, as this can then help us better comprehend behavior and performance in real-world environments (Kim et al., 2014; Maples-Keller et al., 2017). Particularly, as VR technologies can be designed to place military personnel into adverse, hazardous, and life-threatening virtual simulated contexts, without exposing them to real-world risks, continued empirical analyses are critical in VR effectiveness and application, especially in military contexts.

The completion of the research provides support for the impact of adverse environments on moral competence, and then, the influence of self-control and expressive flexibility on moral competence. Prior research has shown that combat-like environments impact individual performance and behavior (Agaibi & Wilson, 2005). Therefore, this research endeavored to evaluate individuals' moral competence in a computer-simulated combat environment and further examine the effect of self-control and expressive flexibility on moral competence in these adverse environments.

Research Limitations

Several limitations could have influenced the findings. First, this study used a military college population and the results may not be replicable or generalizable beyond the military sample. Additionally, military universities' curriculums demand a higher level of regulation and self-control than are unexpected in other institutions, so this study may also not be generalizable to a civilian college (non-military) population. More so,

as these participants were in a military college, they might have presented with stronger effects in terms of their reported self-control and expressive flexibility than in other, non-military populations. This limitation could impact the correlations.

Second, the recruiting process could have been considered a possible limitation since participants volunteered to complete this study as a way to gain extra credit in their respective psychology courses. While recruiting participants from their psychology courses and providing them with extra credit to participate is a common method of recruitment in the social sciences field, there are risks in interpreting studies conducted in this context. Perhaps participants were not truly interested in participating in the study and might not have felt motivated to put the required effort into each task assigned to them.

Third, each scale that participants completed was self-reported. While self-reports are a common methodology in many behavioral science disciplines, there are many risks to this methodology. Specifically, participants might not have reported truthfully in response to their feelings of self-control or expressive flexibility. Additionally, this study did not obtain a baseline of self-control, expressive flexibility, or moral competence. The scales were completed a week following the initial study to avoid potential performance bias (e.g., participants reporting themselves as highly self-controlled or highly flexible in the regulation of emotional expression following simulated combat); however, it is important to note that the one-week lapse could have allowed for multiple confounding factors to influence self-perceptions, adding noise to the data.

Conclusion

Findings from this endeavor suggest that following exposure to simulated combat environments, regardless of apparatus, an individual's moral competence increases. Furthermore, an individual's self-control, not expressive flexibility, positively impacted moral competence. In particular, following exposure to simulated combat environments, individuals might have felt more altruistic and ethical, and consequently, their moral competence heightened, or potentially, the exposure to simulated combat environments could have encouraged the need to promote mindfulness in one's values and universally accepted moral principles. More so, as the results suggested, an individual's self-control positively impacted moral competence, so possibly individuals with high self-control were more likely to regulate their emotions and impulses which subsequently helped their ability to judge and evaluate challenging moral dilemmas. Due to the presence of moral conflicts in combat-like environments, individuals with high self-control might be more likely to address these conflicts because they are more likely to manage their impulses and emotions. This regulation, in turn, might help support the ability to solve moral problems and dilemmas successfully and effectively

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