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Urgent decision-making in extreme circumstances: Associations with cognitive reflection and with responses to moral dilemmas

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It has been proposed that urgent decision making in extreme circumstances may be based on two systems of information processing: affective and rational (Cosentino, Azzollini, Depaula, & Castillo, 2017). Given that the model of urgent decisions has been recently developed, the aim of this study was to determine its characteristics and relationships with relevant variables: (a) the tendency to inhibit dominant but incorrect responses and to promote a reflective process that leads to the correct responses and (b) the resolution and difficulty of high-conflict personal moral dilemmas. We used an intentional sample of 416 university students from a military academy. The results showed that urgent decision making in extreme circumstances is related to general preferences for intuition or deliberation, cognitive reflection, and reaction to high-conflict personal moral dilemmas. Notably, urgent decision making based on rationality was positively associated with cognitive reflection and a utilitarian way of solving high-conflict personal moral dilemmas. Also, both rational and affective/emotional urgent decision-making types were found to be associated with the perceived difficulty in solving the dilemmas. The model of urgent judgments in extreme circumstances can be useful because it contributes to describing the optimal cognitive and decisional profile for the selection of human resources in activities that involve facing contexts of high uncertainty where fast decision making is required, such as tasks performed by professional rescue or combat personnel.

Key words: Decision making, Decision theory, Rationality, Affection, Military academy.

People working in high-risk environments (e.g., police, military personnel, rescuers and airline pilots) must make quick and effective decisions. These environments sometimes include extreme circumstances that arise suddenly and come as a surprise. These circumstances are novel because the personnel have no specific prior knowledge or experience coping with them. Such scenarios require quick decisions, and their outcomes are likely to involve the life or death of themselves or others. The professional staff can face such conditions by following their feelings or by rationally

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evaluating the situations and calculating alternatives to decide how to behave. For example, in disaster scenarios rescuers must make decisions throughout complex rescue tasks. According to Grandori (2015), decision making must be fast and reliable when the consequences of mistakes can be fatal and irreversible. This author argues that professionals working in uncertain and risky environments, where unforeseen situations may arise, should respond to problems that have not been previously classified and for which effective response models are not available.

Studies on the relationship between decision making and effectiveness in situations of high uncertainty have been based on dual-process theories (Kahneman & Frederick, 2002). Dual models have postulated two independent and competitive forms of reasoning: an automatic, largely unconscious process (System 1); and an analytical, rational, and conscious process (System 2; Evans, 2012; Evans & Stanovich, 2013; Kahneman, 2003). System 1 involves little effort, speed, and is strongly dependent on context, while System 2 is slower than System 1 and functions sequentially (Evans & Stanovich, 2013). The processing speed that characterises each of the systems is one of the variables that differentiate System 1 from System 2 processing. Evans (2012) used the term received view of dual-process theory to refer to the proposal made by various theorists during the 1990s and established in about 2000. According to the received view of dual-process theory, the slower System 2 processes depend on serial operations that take up time and resources and are limited by the capacity of the working memory. In contrast, System 1 has been described as fast, implicit, parallel processes that do not involve executive working memory resources. However, Evans (2012) stated that theories based on dual models have several fallacies, e.g., quick processing implies the use of System 1 processing and System 1 leads to cognitive biases. In this regard, we assume that some of the fallacies of dual theories are that System 1 processing is always and only used when judgments are made quickly, and that rational processing is only conscious. Conversely, Evans (2012) argues that fast decision making corresponds to System 2 processing, where quick judgment is based on simple and heuristic rules. In addition, various theorists agree that fast and correct decisions could be based on the processing of large amounts of information, even greater than the amount used in the sequential process, due to the advantage of parallel processing, although simple heuristics can also be used in such trials (Betsch, & Kunz 2008; Eisenhardt, 1989; Grandori, 2015).

Consistent with criticisms of the received view of dual-process theory, Cosentino, Azzollini, Depaula and Castillo (2017) argued that fast judgments can be based on either emotion or rationality and that quick decision making does not inherently imply incorrect results. According to Cosentino et al. (2017), urgent decision making in extreme circumstances has two dimensions: a dimension named affective urgent decision, which refers to decision making based on a subjective reaction associated with the emotional state of the person; and another dimension named rational urgent decision, which refers to decision making characterised by cognitive processing of information, which includes assessment of pros and cons of different responses to the urgent situation, calculation of probabilities of success or failure, and behaviour planning, among other types of rational mental processing.

A recent study on volunteer firefighters has found a positive association between rational urgent decision making in extreme circumstances and effective performance in psychological first aid, a type of assistance given to people immediately after a disaster to prevent post-traumatic disorders (Azzollini, Depaula, Cosentino, & Bail Pupko, 2018). A study on peacekeepers has found that rational urgent decision making in extreme circumstances is associated with shorter reaction time and that emotional urgent decision making in extreme circumstances is associated with less effectiveness in situations of cultural uncertainty (Cosentino, Azzollini, Depaula, & Castillo, 2016). Another study on professional personnel (including military personnel) who provide assistance to people affected by disasters has shown that emotional urgent decision making is one of the psychological characteristics of an optimal profile for early psychological assistance to people affected by disasters: emotional decision making in extreme circumstances is negatively associated with effective response

in first psychological aid (Azzollini, Cosentino, & Depaula, 2019). In addition, emotional urgent decision making in extreme circumstances was found to be less effective in psychological first aid behaviours in professional personnel (Azzara, Grinhauz, & Azzollini, in press; Grinhauz, Azzara, Otamendi, & Azzollini, 2019). It can thus be argued that urgent decisions based on rationality are positively related to effective responses and, conversely, urgent decisions based on emotion are negatively related to effective responses.

So far, the relation between decision making and moral dilemmas has received much attention since the seminal work by Greene, Sommerville, Nystrom, Darley, and Cohen (2001). In empirical research, moral judgment is challenged by means of moral dilemma, which could be classified into non-moral, impersonal-moral, and personal moral dilemmas (Carmona-Perera, Caracuel, Pérez-García, & Verdejo-García, 2015; Greene et al., 2001; Koenigs et al., 2007). In personal moral dilemmas, individuals could make the decision to physically harm individuals or groups in order to save as many people as possible, which could involve emotional conflicts (Greene et al., 2001). Personal moral dilemmas are classified into low- and high-conflict dilemmas, based on the reaction times and consensus (Carmona-Perera et al., 2015). Specifically, responses to high-conflict personal moral dilemmas are distinguished by lower consensus among individuals and longer reaction time than the other dilemmas (Greene, Nystrom, Engell, Darley, & Cohen, 2004). Responses to high-conflict personal moral dilemmas that comprise harming others to serve a greater good (i.e., positive responses to dilemmas) are named utilitarian responses because they involve emotionally aversive actions (e.g., suffocating a baby to save a group of people; Greene et al., 2004). From a neuropsychological point of view, utilitarian responses involve cognitive brain networks, including the dorsolateral prefrontal cortex and the anterior cingulate, while non-utilitarian responses (i.e., deontological) involve affective processing brain areas such as the ventromedial prefrontal cortex (Greene et al., 2001; Greene et al., 2004; Koenigs et al., 2007). Therefore, we assumed that emotional or rational urgent decision making in extreme circumstances is expected to affect the resolution of high-conflict personal moral dilemmas. In consequence, we propose two hypotheses: (1) Rational urgent decision making in extreme circumstances affects the resolution and/or the solving difficulty of high-conflict personal moral dilemmas; (2) Emotional urgent decision making in extreme circumstances affects the resolution and/or the solving difficulty of high-conflict personal moral dilemmas.

Another type of information processing that has gained much attention is cognitive reflection (Frederick, 2005). Cognitive reflection is considered an ability or disposition of an individual to resist informing the first response that occurs to him/her. It is linked to the ability to inhibit and edit "intuitive" responses and is positively related to rational thinking (Campitelli & Gerrans, 2014). Because rational urgent decision making in extreme circumstances involves rational processing of information, such as weighing pros and cons, we assume that urgent decision making is positively linked to cognitive reflection. Hence, we propose a third hypothesis: Rational urgent decision making in extreme circumstances is positively associated with cognitive reflection.

The general aims of this work were to extend the characterisation and nomological network of the urgent decision making in extreme circumstances model and to provide evidence about the criterion validity of BUDECI.

Method

Participants

Our intentional sample included 416 military cadets (101 women, 24.3%), age *M*=22, *SD*=2.6, range 17-30 years, who were attending first (*n*=123), second (*n*=120), third (*n*=68) and fourth

(*n*=96) year of a Military Academy. The cadets participated voluntarily, granted informed written consent and were guaranteed confidentiality of the data collected.

Measuring instruments

Bases for Urgent Decisions under Extreme Circumstances Inventory (BUDECI). This inventory, This eight-item inventory, originally developed in Spanish (named *Inventario Bases de las Decisiones Urgentes en Circunstancias Extremas*, IBDUCE; Cosentino et al., 2017), evaluates the urgent decision making in extreme circumstances model, which includes two factors: (1) affective/emotional urgent decisions (affective UD, four items), i.e., the individual tendency to make urgent decisions based on affection or emotion under extreme circumstances (sample item, *what my heart dictates*), and (2) rational urgent decisions (rational UD, four items), i.e., the individual tendency to make urgent decisions based on rationality under extreme circumstances (sample item, *evaluating pros and cons*). Responses were given on a scale rating from 1 (*totally false*) to 7 (*totally true*). The BUDECI presents face, structural (e.g., CFI>.95), convergent and discriminant (with the Big Five and the preference to make decisions in ordinary situations) validities. The alpha coefficients for the factors in this sample were .84 for affective UD and .76 for rational UD.

Preference for Intuition and Deliberation (PID). The PID evaluates individual preference for making decisions based on intuition (i.e., in emotionality, System 1 processing of the received dual models) or cognition (i.e., in deliberation, System 2 processing; Betsch, 2004; Betsch & Iannello, 2010; Betsch & Kunz, 2008) in ordinary situations. The items consist of statements. The participants must indicate their agreement using a 5-point scale ranging from 1 (*I very much disagree*) to 5 (*I very much agree*). A sample item for deliberation preference is before making decisions, *I first think them through*; a sample item for intuition preference is *I listen carefully to my deepest feelings*. In the present study, we used an Argentine adaptation of the PID (PID-AE, Cosentino & Azzollini, 2019), consisting of eight items to measure the preference for intuition (emotionality) and eight items to measure the preference for deliberation (rationality), with adequate psychometric properties. The internal consistencies of the PID-AE in this sample were alpha=.79 for preference for intuition, and alpha=.74 for preference for deliberation.

Brief Moral Decision-Making Questionnaire (BrMoD-30). The BrMoD-30 is a Spanish version and adaptation of the BrMoD questionnaire (Carmona-Perera et al., 2015), consisting of a selection of the moral dilemmas of Greene et al. (2001). We used eight non-moral dilemmas of BrMoD-30 to indicate logical reasoning capacity and ten high-conflict personal moral dilemmas to evaluate the utilitarian and non-utilitarian (i.e., deontological) response to the dilemmas. A sample item for non-moral dilemma is named *Computer* (Greene et al., 2001): *You are looking to buy a new computer. At the moment, the computer that you want costs $1000. A friend who knows the computer industry has told you that this computer's price will drop to $500 next month. If you wait until next month to buy your new computer, you will have to use your old computer for a few weeks longer than you would like to. Nevertheless, you will be able to do everything you need to do using your old computer during that time. Is it appropriate for you to use your old computer for a few more weeks in order to save $500 on the purchase of a new computer?* A sample item for high-conflict personal moral dilemmas is named *Vaccine Test: A viral epidemic has spread across the globe killing millions of people. You have developed two substances in your home laboratory. You know that one of them is a vaccine, but you don't know which one. You also know that the other one is deadly. Once you figure out which substance is the vaccine you can use it to save millions of lives. You have with you two people who are under your care, and the only way to identify the vaccine is to inject each of these people with one of the two substances. One person*

will live, the other will die, and you will be able to start saving lives with your vaccine. Is it appropriate for you to kill one of these people with a deadly injection in order to identify a vaccine that will save millions of lives? Individuals must respond "yes" or "no" to the dilemmas. An affirmative response to a high-conflict personal moral dilemma corresponds to a utilitarian response, and a negative response corresponds to a non-utilitarian response (Greene et al., 2008). In addition, BrMoD-30 includes the assessment of the degree of subjective difficulty in the decision-making process, and the participant must use a scale from 1 (*low difficulty*) to 10 (*high difficulty*) to inform about it. An Argentine adaptation of BrMoD-30 was used (Cosentino, 2019a). The internal consistencies for this sample were as follows: solution to high-conflict personal moral dilemmas, alpha=.78; difficulty in high-conflict personal moral dilemmas, alpha=.94.; solution to non-moral dilemmas, alpha=.51; and difficulty in non-moral dilemmas, alpha=.92

Cognitive-Reflection Problems in the Health, Nutrition, and Finance Domains (CRP-HNF). This test measures the tendency to inhibit a dominant but incorrect response and to promote a reflective process that leads to the correct response. The original version of this test is the Cognitive Reflection Test (CRT; Frederick, 2005), which includes three items. However, we used the Argentine adaptation of the 6-item Finucane and Gullion (2010)'s version of the CRT (Cosentino, 2019b). A sample item is *if it takes 5 machines 5 minutes to make 5 widgets, how long would it take 100 machines to make 100 widgets?* The participant indicates the number of minutes. This measurement instrument presented an internal consistency of alpha=.75 in this sample.

Results

We analysed the differences between groups of cadets from different courses in emotional bases for urgent decision making under extreme circumstances (BUDMEC) and rational BUDMEC. The groups were compared in these variables following Sauder and DeMars (2019) who, as a result of analysing many tests for multiple comparisons under different assumptions, proposed using the Games-Howell test when the groups have unequal sizes. The results were not statistically significant for emotional BUDMEC (1 *vs.* 2, t=0.81, 1 *vs.* 3, t=2.53, 1 *vs.* 4, t=2.36, 2 *vs.* 3, t=1.86, 2 *vs.* 4, t=1.57, 3 *vs.* 4, t=-0.53, *ns*, respectively) or for rational BUDMEC (1 *vs.* 2, t=1.94, 1 *vs.* 3, t=1.42, 1 *vs.* 4, t=1.23, 2 *vs.* 3, t=-0.23, 2 *vs.* 4, t=-0.62, 3 *vs.* 4, t=-0.32, *ns*, respectively). Consequently, a single pool of participants was used for data analyses.

The variables presented the following descriptive statistics: the BUDECI emotional BUDMEC, M=15.1, SD=6.1, range 4-28; the BUDECI rational BUDMEC, M=20.6, SD=4.7, range 4-28, the PID-AE preference for intuition M=26.0, SD=5.7, range 8-40; the PID-AE preference for deliberation, M=32.4, SD=4.3, range 9-40; the CRP-HNF, M=1.4, SD=1.6, range 0-6, solution to high-conflict personal moral dilemmas, M=5.1, SD=2.7, range 0-10; difficulty in high-conflict moral dilemmas, M=53.2, SD=27.4, range 10-100; solution to non-moral dilemmas, M=6.8, SD=1.3, range 2-8; and difficulty in non-moral dilemmas, M=16.7, SD=11.4, range 8-80.

We found positive associations between the BUDECI rational BUDMEC and the PID preference for intuition (r=.55; p<.01) and between the BUDECI emotional BUDMEC and the PID preference for deliberation (r=.19; p<.01). The BUDECI rational BUDMEC and the CRP-HNF showed a positive association, i.e., the individual tendency to make urgent rational decisions in extreme circumstances was associated with cognitive reflection (r=.13; p<.01).

Regarding the dilemmas, the results showed that the BUDECI rational BUDMEC is associated with the utilitarian resolution of high-conflict personal moral dilemmas (r=.11; p<.05) and that it is associated with greater difficulty in decision making (r=.10; p<.05). These results reveal that rational urgent decisions in extreme circumstances are linked to a utilitarian resolution of high-

conflict personal moral dilemmas and that rational cognitive processing in decision making, such as weighing pros and cons, involves the effort inherent to mental processing that is perceived as difficulty in producing responses to dilemmas. Finally, the BUDECI emotional BUDMEC was also associated with difficulty in solving high-conflict personal moral dilemmas (r=.13; p<.01). This result shows that emotional state affects the processing of information in the decision making on moral dilemmas. Concerning the results and difficulties in solving the non-moral dilemmas from the BrMoD-30 test, we found no statistically significant associations with the BUDECI dimensions.

Discussion

This research studied the characteristics and effects of rational or emotional urgent decision making in dangerous and unexpected situations. Consistent with previous findings, emotional urgent decisions and rational urgent decisions are positively associated with dispositions to decide based on intuition and deliberation in ordinary situations, respectively (Cosentino et al., 2017). However, we found new characteristics of urgent decision making in extreme circumstances.

The rational basis for urgent decision making is manifested in the functioning of the mental mechanism of cognitive reflection, a type of information processing that inhibits incorrect responses that appear to be correct, in favour of selecting correct responses, even if they do not appear to be correct. This finding implies that cognitive reflection is involved in rational urgent decision making under extreme circumstances. In other words, the rationality to make quick decisions under extreme contexts involves not only assessing the pros and cons of responses, calculating probabilities of success or failure, or behaviour planning, but also engaging in the cognitive reflection. In addition, the positive linkage between scores of self-informed rational characteristics and objective task resolutions, which require specific mental processing, provides criterion validity to the BUDECI.

Another characteristic of urgent decision making in extreme circumstances is that the rational basis for urgent decision-making leads to a utilitarian resolution of problems such as those originating in high-conflict personal moral dilemmas. In these dilemmas, the participant chooses to make a valuable sacrifice, such as killing or harming a highly valued individual to serve a greater good, like saving many other human lives. Making rational decisions entails difficulty in solving dilemmas. This difficulty suggests that rational processing involves a burden on the individual and the concomitant effect that the use of cognitive resources, e.g., weighing many alternatives, leads to a subjective perception of difficulty. Similarly, making urgent affective decisions in extreme circumstances is linked to greater difficulty in solving high conflict personal dilemmas. Emotional conflict, defined as a stressful element inherent in any ethical-moral decision, may affect the processing of information and increase the subjective sense of difficulty.

Judgment is an important element in the intervention of professionals, like military personnel, in extreme circumstances. Depending on the greater good, military personnel may put at risk and even lose their lives or that of their most precious fellow men. Because military missions are based on prior knowledge and rules, it can be assumed that military personnel must act rationally to obtain the best outcome from each intervention. Even in dangerous, unexpected, novel and important situations, the rules must not be broken. However, since not all possible scenarios can be foreseen in regulations, manuals and directives, the cognitive processing of the individual is required to interpret the rules in terms of the immediate novel context, resulting in an effective and adaptive behaviour for the mission. Therefore, urgent decision making in extreme

circumstances is valuable as a predisposing component of military personnel behaviour in such contexts.

High-conflict personal moral dilemmas are problems that implicitly represent the complications that military personnel may face in action. Moral dilemmas can be resolved in utilitarian or non-utilitarian (i.e., deontological) ways (Greene et al., 2001; Greene et al., 2004; Koenigs et al., 2007). If the response to a high-conflict moral dilemma is utilitarian, it means that the individual has agreed to make a significant sacrifice for the greater good. Rational urgent decision making in extreme circumstances leads to utilitarian solutions to moral dilemmas. In other words, taking urgent and rational decisions in extreme circumstances, which involves processing available information quickly, calculating probabilities, weighing pros and cons, and planning behaviour, leads to responses in favour of a greater good, despite the sacrifices that should be made. Consequently, we assume that this type of characteristic should be important for professional personnel that face extreme circumstances. For example, rescuers may have to make urgent decisions in extreme circumstances when contacting individuals affected by disasters.

Limitations

We must note some limitations. The specificity of the sample, i.e., the participation of military students, could hinder the generalization of the findings to professional personnel or other groups. Another limitation is the use of causal assumptions based on a non-experimental correlational study, which is a fundamental inconvenience for studies on individual psychological attributes. We would need longitudinal investigations and samples of expert personnel who perform activities in conditions of individual risk to confirm and extend our findings.

Future studies

Because the urgent decision making under extreme circumstances model is a new theoretical framework, several investigations should be carried out. For example, future studies should investigate the emotional concomitants of the rational and affective urgent decision making in extreme situations. In addition, the detailed cognitive processing of urgent decision making in extreme circumstances should be determined. Further research could compare urgent decision making between professional personnel and students in the same profession. Finally, urgent decision making in extreme circumstances should be studied in a real-life context, such as rescue or combat situations.

Concluding remarks

The model of urgent decision making under extreme circumstances is a recent model that, although linked to the received view of dual-process theory, departs from it by assuming that there may be quick, rational and effective decisions. This research made it possible to find additional characteristics for the dimensions and for the measuring instrument of this model.

As regards resolving simple but misleading situations, rational decision making was positively associated with the successful resolution of problems that require cognitive reflection. We, therefore, assume that cognitive reflection is involved in urgent decision making based on rationality under extreme circumstances.

By contrast, resolving high-conflict personal moral dilemmas requires both rational and emotional aspects of individuals. The results showed that as the involvement of rationality or emotion in rapid decision making under extreme circumstances increases, the subjective perception of difficulty in resolving high-conflict personal moral dilemmas increases as well, a finding that can be interpreted as a sign of the high activity of rational or emotional processing in the decision making systems of individuals. Finally, the increased involvement of rationality as a basis for urgent decision making in extreme circumstances leads to a more utilitarian solution of high-conflict personal moral dilemmas, that is, morally serious problems are solved by making important sacrifices for a greater good.

Knowing individual profiles may allow institutional authorities to determine beforehand what human resources could be readily available in the field, i.e., who would be able to assist soldiers and civilians affected by conflict, such as a soldier paralysed in combat or a civilian affected by a disaster. The BUDECI, a short instrument for measuring urgent decision making, could provide useful information for determining a cognitive and decisional profile for an individual's performance in intervention tasks in extreme circumstances.

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A tomada de decisões urgentes em circunstâncias extremas: Associações com a reflexão cognitiva e com respostas a dilemas morais

Foi proposto que a tomada de decisões urgentes em circunstâncias extremas pode ser baseada em dois tipos de processamento de informações: afetivo e racional. Como o modelo de decisões urgentes é recente, o objetivo deste estudo foi determinar suas características e relações com variáveis relevantes. Utilizamos uma amostra intencional de 416 estudantes universitários de uma academia militar. Os resultados mostraram que a tomada de decisões urgentes em circunstâncias extremas está relacionada a preferências gerais por intuição ou deliberação, reflexão cognitiva e reação a dilemas morais pessoal altamente conflituosos. Notavelmente, a tomada de decisão urgente baseada na racionalidade foi positivamente associada à reflexão cognitiva e a uma forma utilitária de resolver dilemas morais pessoais de alto conflito. Além disso, tanto a tomada de decisões urgentes, tanto racionais como afetivas/emocionais, foram associadas à percepção da dificuldade em resolver dilemas morais pessoais de alto-conflito. O modelo de juízos urgentes em circunstâncias extremas pode ser útil porque contribui para descrever o perfil cognitivo e decisório óptimo para a seleção de recursos humanos em atividades que envolvem enfrentar contextos de alta incerteza onde a tomada de decisões rápidas é necessária, tais como tarefas realizadas por profissionais de resgate ou pessoal de combate.

Palavras-chave: Tomada de decisão, Teoria da decisão, Racionalidade, Afetividade, Academia militar.

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