

Abstract

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Making errors represents a stressful event, and the way errors are dealt with are significantly influenced by individuals' error orientation. Drawing on the stress literature, scholars have identified several dimensions underpinning error orientation construct. Nevertheless, empirical studies have overlooked the construct complexity and do not provide clear theoretical anchors for its operationalization. This study aims to contribute to the error orientation literature by proposing and empirically testing a theoretical framework that integrates stress and attitude theories, on a sample of 443 employees. Specifically, we examined the error orientation facets' relationships with both two Hofstede's cultural factors (i.e., power distance and uncertainty avoidance) and work errors (i.e., slips/lapses and mistakes types). Findings from the test of alternative models and from a structural equation model showed the uniqueness of each facet, also in relation to additional study variables, supporting the relevance of adopting this twofold theoretical framework in order to better understand the nature of each facet.

Keywords: Error orientation, Power distance culture, Uncertainty avoidance culture, Errors, Hofstede.

This study was carried out in accordance with the recommendations of the Ethic Committee of the first author's Department. All subjects gave written informed consent in accordance with the Declaration of Helsinki.

1 Errors are part of our daily lives. Every individual is occasionally confronted with
 2 oversights, omissions, lapses, wrong actions, misunderstandings, misjudgments or mistakes.
 3 This assumption is also valid in relation to one’s work life. Indeed, “people make mistakes,
 4 machines break. No one is perfect and no organization is likely to achieve this ideal” (LaPorte
 5 & Consolini, 1991, p.19). However, although errors are undesirable performance failures that
 6 may lead to negative consequences –such as frustration and stress, delay in goal attainment,
 7 loss of time and income, or even injuries or accidents– they may also contribute to subsequent
 8 performance (Frese & Keith, 2015). Indeed, they allow for improvements and new insights,
 9 for instance by providing valuable feedback to analyze the situation or by increasing
 10 motivation to change routines, learn something new or develop innovations (Edmondson &
 11 Lei, 2014; van Dyck, Frese, Baer, & Sonnentag, 2005).

12 Some scholars (Rybowiak, Garst, Frese, & Batinic, 1999), drawing on Lazarus’
 13 transactional stress theory (Lazarus & Folkman, 1984), have conceived errors as stressful
 14 events to cope with. Indeed, the way individuals appraise wrong actions and their willingness
 15 to perceive the potentially positive consequences of errors is influenced by the orientation
 16 towards errors. Individuals with a positive orientation perceive errors as learning
 17 opportunities, appraise them in a favorable light, and tend to constructively cope with them
 18 (Harteis, Bauer, & Gruber, 2008; Rybowiak et al., 1999). They also use the experience of
 19 errors as a motivational basis for engaging in reflective processes with the goal of adopting
 20 effective strategies to be resilient to their negative outcomes, prevent further errors, extract
 21 their informative value and learn for the future (Frese & Keith, 2015; Harteis et al., 2008).
 22 *Vice versa*, individuals with a negative orientation perceive errors as threats, appraise them
 23 with strain and frustration, and tend to deny or hide them when they occur (Edmondson &
 24 Lei, 2014; Rybowiak et al., 1999; Zhao & Olivera, 2006). Negative attitudes tend to activate a

1 deflating cycle that leads to subsequent errors. This may be due, for instance, to negative
2 emotions (such as anxiety or concern) that distract resources from effective error management
3 (Brown, Westbroo, & Challagalla, 2005; Hobfoll, 2011). In addition, when individuals
4 attempt to hide a mistake, for example by denying one's own responsibility, this might
5 prevent changes and inhibit learning for future work tasks (Edmondson & Lei, 2014).

6 Consistent with this framework, Rybowskiak and colleagues (1999) conceptualized error
7 orientation as a construct involving eight facets related to the appraisal and coping processes
8 to manage stressors. However, after reviewing the literature, it is still not clear how the theory
9 is specifically reflected to these dimensions. Moreover, empirical studies that adopted this
10 model have tended to overlook the theoretical framework, merging or selecting some of the
11 eight dimensions without clearly explaining their assumptions. In light of this, the aim the
12 present paper is to contribute to the theoretical conceptualization of error orientation by
13 proposing and empirically testing a twofold frame incorporating stress theory with attitude
14 theory.

15 Indeed, scholars have highlighted that attitudes may be depicted not only by their
16 positive–negative valence, but also by their components (beliefs, emotions and intentions to
17 behave; Ajzen, 1989; Rosenberg & Hovland, 1960). Thus, error orientation may be further
18 conceived of as the individual attitude toward errors, expressing a *cognitive* component (e.g.,
19 believing that mistakes are helpful to improve future decisions, trusting that the earlier an
20 error is detected the lesser its consequences will be, or thinking that monitoring one's own
21 behavior is important to promptly detect possible erroneous actions); an *affective* component
22 (e.g., feeling anxious or guilty or careful in the case of making an error); and a *behavioral*
23 component (e.g., being willing to recover a wrong action as soon as possible, or trying to
24 cover it up, or relying on teammates' help).

1 This tripartite view of attitudes (Rosenberg & Hovland, 1960) also assumes that each
2 component may express different evaluations, either negative or positive. Thus, error
3 orientation dimensions may describe positive or negative thoughts, positive or negative
4 emotions, and positive or negative behavioral orientations. This may be the case of employees
5 who believe that errors will lead to improvements, but at the same time feel anxious or are
6 willing to cover up their own errors. Taken together, the three components and their valence
7 may support positive or negative reactions. For instance, by analyzing employees' attitude
8 towards change, Piderit (2000) showed that when all components had a positive valence,
9 change was allowed. Conversely, the non-consistency among component valence could foster
10 ambivalence toward change, with potentially debilitating effects on responses to change (i.e.,
11 resistance).

12 In order to better understand the nature of the different error orientation facets, this paper
13 further aims to analyze whether and how each facet 1) may provide a unique contribution to
14 containing or enhancing erroneous behavior; and 2) may be shaped by cultural factors. With
15 respect to our first aim, to the best of our knowledge, although some studies have investigated
16 the relationship of error orientation with errors (Drach-Zahavy & Pud, 2010; Farnese et al.,
17 2018; Hofmann & Mark, 2006; Mark et al., 2007), none have considered all of the error
18 orientation dimensions, leaving this important issue unexplored.

19 As to the second aim, in line with transactional stress theory (Lazarus & Folkman, 1984)
20 and the subsequent assumption that individuals' orientations toward errors are not generalized
21 responses (Huish & Poropat, 2008), we will further examine the relationships between error
22 orientation and cultural factors. Indeed, organizational culture expresses the shared beliefs
23 and values through which employees make sense of reality and contributes to determine the
24 way they represent work events, their feelings and their behavioral choices to solve problems.

1 Regular audit inspections, an error management approach in training, the analysis of customer
2 complaints and keeping near-miss records for accountability are examples of organizational
3 practices that underlie a cultural orientation that conceives errors as a source for learning. At
4 the same time, the adoption of these practices strengthens employees' adherence to consistent
5 norms and values. This study will specifically focus on Hofstede's (1984, 2001) cultural
6 dimensions, in line with some scholars' suggestion that they may be particularly relevant for
7 dealing with errors in work contexts (Gelfand, Frese, & Salmon, 2011).

8 Overall, this paper aims to contribute to the conceptualization of individual attitudes
9 towards errors, providing stronger theoretical roots to the error orientation dimensionality, a
10 prominent topic in organizational life. This study also aims to provide initial evidence on the
11 specific relationship that each facet can have with errors (enhancing or hindering the
12 likelihood of making them) and with cultural factors (namely, when organizational cultures
13 have a high level of power distance relationships and when they are low tolerant of
14 uncertainty).

15 **Conceptual framework and hypotheses**

16 ***Error orientation, a multidimensional construct***

17 Drawing on the transactional stress framework (Lazarus & Folkman, 1984), Rybowskiak
18 and colleagues (1999) stated that the way employees interpret and deal with the occurrence of
19 an error (namely, a stressful event) depends on their error orientation, which is the way they
20 perceive and appraise an error. Consequently, they proposed a multidimensional construct and
21 a related scale (the EOQ–Error Orientation Questionnaire), initially including six facets: *error*
22 *competence*, the tendency of developing the knowledge and capability to promptly cope with
23 errors; *learning from errors*, the tendency of using errors to plan and improve work processes
24 to avoid wrong behavior in the future; *error risk taking*, a state of openness and flexibility

1 towards errors; *error strain*, the general tendency of feeling negative emotions (e.g., fear,
 2 embarrassment, and anger) when errors are evoked; *error anticipation*, a general awareness
 3 that errors will happen as well as recurrent negative thoughts about them; and *covering up*
 4 *errors*, the tendency to deny or hide an error, in order to avoid being blamed. In a later study,
 5 the authors (Rybowiak et al., 1999) added two further dimensions: *thinking about errors*, the
 6 tendency of being aware of and carefully reflecting on one's own mistakes; and *error*
 7 *communication*, the tendency to openly share information about errors with colleagues.

8 In order to summarize the empirical literature on error orientation adopting Rybowiak
 9 and colleagues' model, a qualitative review has been conducted. To find publications for
 10 inclusion, we searched WoS databases using specific keywords linked to the Error Orientation
 11 Questionnaire and to Rybowiak et al.'s (1999) seminal work. We also used a snowball
 12 approach by searching the references of relevant publications to identify further papers.
 13 Inclusion criteria were: *a*) publications that measured EOQ or some of its scales; *b*) temporary
 14 lag from 1999 to July 2019; *c*) selection of empirical papers and dissertations, whereas other
 15 scholarly publications (conference papers, working papers, and practitioner publications)
 16 were removed. The final list included 34 publications and 36 studies (see Table 1).

17 The review shows that very few studies have included all eight facets, most of them
 18 relying on a few facets or only one. For instance, some authors solely focused on facets
 19 related to the problem/emotion-focused behavioral coping strategies, ignoring appraisal facets
 20 (Fruhen & Keith, 2014; Tjosvold, Yu, & Hui, 2004; van Dyck et al., 2005). Also, *risk taking*
 21 and *error anticipation* have been used less frequently than other facets and, when used, the
 22 latter showed low reliability which resulted in its exclusion from further analyzes. When
 23 taking in consideration the structure of the EOQ scale, the literature review also demonstrates
 24 that most studies empirically identified a reduced number of factors, as a result of the

1 aggregation of some facets. Particularly, some studies aggregated the facets according to their
 2 positive *versus* negative attitude toward errors thus defining two broader dimensions (i.e.
 3 error management *versus* error aversion; van Dyck et al., 2005), or three dimensions by
 4 splitting the negative orientation into its *strain* and *covering up* components (Bauer &
 5 Mulder, 2013; Leicher & Mulder, 2016). Moreover, some studies have blurred the model by
 6 merging some facets with other constructs. Overall, the literature seems to suggest a
 7 fragmented view of the error orientation construct, with alternative models not consistent with
 8 Rybowskiak et al.'s (1999) and no studies that have explored the factorial structure of the EOQ
 9 scale including all (and only) the error orientation facets.

10 [INSERT-TABLE-1-ABOUT-HERE]

11 In the next sections we compare models rooted in different theoretical frameworks.
 12 Specifically, according to the literature review depicted above, and in line with both the stress
 13 (Lazarus & Folkman, 1984) and attitude frameworks (Rosenberg & Hovland, 1960), we
 14 hypothesize five alternative models to define the error orientation construct (see Table 2).

15 *Error orientation by adopting the stress framework*

16 Rooted in Lazarus and Folkman's (1984) stress model, we can trace some of Rybowskiak
 17 and colleagues' facets to the appraisal of erroneous actions (i.e., one positive facet, *risk* and
 18 two negative, *anticipation and strain*). We can also connect the other facets to the different
 19 coping strategies for dealing with erroneous behaviors: four of them refer to problem-focused
 20 strategies (*thinking, communication, competence, and learning*) and one expresses an
 21 emotion-focused coping strategy (*covering up*). Thus, an error orientation model (M1) based
 22 on stress theory as depicted above would be four-faceted, respectively reflecting the positive
 23 and negative appraisal of errors, and the problem- and emotion-focused behavioral strategies.

1 On the other hand, some authors (Fruhen & Keith, 2014; Harteis et al., 2008; van Dyck,
 2 2005) considered error strain as a reaction to negative emotions and merged it with *covering*
 3 *up* in a general avoidant coping strategy. An alternative model to M1 may then be a four-
 4 faceted model (M2) as follow: positive appraisal of errors (*risk*), negative appraisal of errors
 5 (*anticipation*), problem-focused coping strategies (*thinking, communication, competence,*
 6 *learning*; the so-called “error management approach”) and emotion-focused coping strategies
 7 (*strain, covering up*; the so-called “error aversion approach”).

8 *Error orientation by adopting the attitude framework*

9 Error orientation can also be described by drawing on attitude theory (Ajzen, 1989;
 10 Rosenberg & Hovland, 1960), specifically considering attitude’s positive and negative
 11 valences. In particular, five error orientation facets capture the positive valence toward errors
 12 (*risk, thinking, communication, competence, learning*) whereas the other three capture the
 13 negative valence (*anticipation, strain, covering up*). In line with this, a more parsimonious
 14 model (M3) would propose a dichotomic conceptualization of error orientation, one facet
 15 expressing a positive attitude toward errors and the other a negative one. This model is
 16 consistent with authors that conceive error orientation as bipartite (e.g., Fruhen & Keith,
 17 2014; Tjosvold et al., 2004; van Dyck et al., 2005), although none of them tested it including
 18 all of the eight dimensions.

19 In addition, drawing on the tripartite attitude model (Rosenberg & Hovland, 1960), error
 20 orientation facets can be also described considering the cognitive, affective and behavioral
 21 components. In particular, three error orientation facets capture the beliefs about errors (*risk,*
 22 *learning, anticipation*), one captures the affective component (*strain*) and the other four
 23 capture the behavioral orientation to cope with errors (*thinking, communication, competence,*
 24 *covering up*). Thus, by integrating the positive/negative valence of the attitude with the

1 tripartite model we could suggest a five-facet model (M4) reflecting a positive (*risk, learning*)
2 and a negative (*anticipation*) cognitive component, an affective component (*strain*), and a
3 positive (*thinking, communication, competence*) and negative (*covering up*) behavioral
4 component.

5 *Error orientation by adopting both the attitude and stress frameworks*

6 Given the relevance of both stress and attitude theories we may also integrate them and
7 suggest another model (M5). Specifically, three error orientation facets are related to the
8 appraisal process: one captures a positive **belief** about errors (*risk taking*); one a negative
9 belief about errors (*anticipation*); a third one is related to the affective component (*strain*).
10 The other five facets are related to the coping process. One expresses a positive cognitive
11 orientation planning how to deal with errors (*learning*). Three facets **express** the problem
12 focused coping strategies: one related to redefying the problem (*thinking*); another one related
13 to seeking for social support (*communication*); another one to problem solving (*competence*).
14 The last facet expresses the emotion focused coping strategies related to denial (*covering up*).

15 *Individual error orientation and errors*

16 The role that employees' error orientation plays within many work processes is well
17 known. Indeed, it has been extensively studied in relation to several personal work-related
18 variables such as self-esteem, self-efficacy, readiness for change and personal initiative
19 (Rybowiak et al., 1999). In addition, research has shown error orientation's relationship with
20 dispositional variables such as goal orientation (Arenas, Tabernero, & Briones, 2006; Schell
21 & Conte, 2008), positive motivational state (Amini & Mortazavi, 2012) and work-related
22 attitudes (Fay & Frese, 2000). Some scholars have also examined error orientation in relation
23 to performance (e.g., Arenas et al., 2006), reflection at work (Hetzner, Gartmeier, Heid, &
24 Gruber, 2011) and meta-cognitive processes (Keith & Frese, 2005; König et al., 2007; Steele-

1 Johnson & Kalinoski, 2014). By applying the individual error orientation at the organizational
 2 level (Putz, Schilling, Kluge, & Stangenberg, 2013; Schell, 2012), others have attested its
 3 relationship with organizational performance indicators, such as economic performance and
 4 firm goal achievement (van Dyck et al., 2005), team innovativeness (Tjosvold & Yu, 2007)
 5 and leadership (Korsten, Stanz, & Blignaut, 2004).

6 The relationship between error orientation and positive performance seems to be
 7 supported by some empirical evidence. Specifically, employees who have a positive attitude
 8 towards errors also activate learning processes that in turn lead to better performance (Keith
 9 & Frese, 2005; Arenas et al., 2006; Steele-Johnson & Kalinoski, 2014; Dimitrova, van Dyck,
 10 van Hooft, & Groenewegen, 2015). Surprisingly, however, few studies have investigated the
 11 relationship between error orientation and performance failure. Exceptions are Mark and
 12 colleagues' studies, which found that nurses' positive orientations toward errors (*thinking,*
 13 *communication* and low *covering up*, aggregated with other variables) predicted lower
 14 medication errors and higher adverse events (Chang & Mark, 2011; Hofmann & Mark, 2006).
 15 Other scholars have shown that problem-focused coping strategies (the so-called error
 16 management approach) decreased healthcare errors (Drach-Zahavy & Pud, 2010; Farnese et
 17 al., 2018). The role of facets expressing a negative orientation have been explored to a lesser
 18 extent.

19 To further investigate the role of each error orientation facet, the second aim of this paper
 20 is to examine whether and how the different facets are associated with employees' errors at
 21 work. Specifically, we propose that each dimension may provide a specific contribution in the
 22 attitude–behavior relationship.

23 With respect to the attitudes' framework and their basic bidirectional valence (Rosenberg
 24 & Hovland, 1960) and in line with previous findings, we hypothesized that the error

1 orientation facets expressing a positive attitude towards errors will be associated with fewer
 2 employee errors. Specifically, employees oriented towards the early detection and careful
 3 analysis of errors (*thinking*), to their prompt recovery (*competence*), to openly sharing
 4 information about errors with teammates (*communication*) and those believing errors may be
 5 a source for improving (*learning*), will also make less errors. Indeed, when employees
 6 perceive an erroneous situation as a learning opportunity (Dahlin, Chuang, & Roulet, 2018)
 7 and the learning outcome as controllable (Pekrun, Frenzel, Goetz, & Perry, 2007), they will
 8 infuse more effort in their tasks (Dimitrova et al., 2015) and will be more prone to apply
 9 proactive strategies, such as seeking for constructive feedback (Winters & Latham, 1996).
 10 **This in turn will lead** to a better understanding of work processes and more knowledge about
 11 how to successfully perform their job (Stern, Katz-Navon, & Naveh, 2008). In general, in line
 12 with stress theories, we assume that positively oriented employees will perceive errors as less
 13 threatening events, thus inducing a lower resource loss (Hobfoll, 2011), and will adopt
 14 problem-focused coping strategies, being more effective in managing stress (Brown et al.,
 15 2005; King & Beher, 2017). In addition, by taking an agentic perspective (Bandura, 2018), we
 16 can further suppose that these orientations support individual's forethought capability,
 17 motivating employees to create action plans, regulate their behavior to achieve the expected
 18 standards, and enhance their self-reflectiveness (Chang & Mark, 2011; Drach-Zahavy & Pud,
 19 2010; Farnese et al., 2018; Hofmann & Mark, 2006).

20 An exception among the positive facets may be *risk taking*. Indeed, employees high in
 21 risk-taking assume that some errors are inevitable to achieve work results or even that it is
 22 better to make mistakes than not accomplish anything (Rybowiak et al., 1999). Their low
 23 alertness for possible error occurrence could decrease monitoring behaviors, thus enhancing
 24 the frequency of errors (Horvath & Zuckerman, 1993). In summary, we hypothesize a

1 significant and negative relationship between *thinking*, *communication*, *competence*, and
 2 *learning* facets and errors, as well as a positive *risk*–errors relationship.

3 On the other hand, following Rybowskiak and colleagues (1999) we can suppose that the
 4 error orientation facets expressing negative believes (*anticipation*), affects (*strain*) and
 5 intentions to behave (*covering up*) will be positively associated with a higher frequency of
 6 employee errors. Specifically, employees who think that the likelihood of erring in
 7 performing their task is high (*anticipation*), who feel negative emotions if errors occur
 8 (*strain*), and who aim to hide their **erroneous actions** (*covering up*), will also more likely
 9 make more errors. Indeed, emotion-focused coping strategies, aimed to modulate unpleasant
 10 affect engendered by an error experience, tend to reduce one’s responsibility and proactivity
 11 in reparative actions and will lead to resignation. Thus, employees will hide the **erroneous**
 12 **action** and avoid reporting the error (*covering up*), thereby increasing the likelihood of
 13 persisting in making errors (Webb et al., 2012). Further, drawing on the emotion-regulation
 14 literature (Webb, Miles & Sheeran, 2012), we can propose that the tendency to prevent the
 15 occurrence of an unpleasant event (*anticipation*) or to feel negative emotions evoked by errors
 16 (*strain*), are appraisal processes that will interfere with cognitive processes and distract
 17 resources away from tasks and when handling errors (Hobfoll, 2011), subsequently enhancing
 18 their frequency. Conversely, it is also plausible that individuals who anticipate possible errors
 19 and are stressed by committing errors, will make less errors because it makes them more
 20 aware and cautious (Brown et al., 2005; Fogarty, 2005; King & Beeher, 2017; Zhao &
 21 Olivera, 2006).

22 We further hypothesize that the strength of the attitude–behavior relationship may be
 23 different for different facets. Specifically, following the tripartite attitude conceptualization
 24 (Ajzen, 1989), we propose that cognitive (*risk*, *learning*, *anticipation*) and affective (*strain*)

1 attitudes toward errors will have a looser association with employees' errors, in comparison to
2 behavioral intentions (*thinking, communication, competence, covering up*).

3

4 ***The role of Hofstede's cultural factors***

5 Literature on error orientation assumes it is a personal attitude that may be shaped by
6 specific contextual variables, affecting the individuals' appraisal of the straining event and
7 their consequent reactions (Huish & Poropat, 2008; Lazarus & Folkman, 1984; Zotzmann,
8 **van der Linden**, & Wyrwa, 2019). Indeed, cultural background permeates organizational life
9 by defining the set of shared assumptions and beliefs. These, in turn, provide meaning and
10 models for employees' work attitudes, perceptions and behaviors, including the way they
11 cope with errors. For instance, Hofstede (1990; 2011) defines cultures as collective
12 phenomena that distinguish the members of one group from others. At the organizational
13 level, they are embedded in visible and conscious practices, namely the employees' shared
14 perception of how activities and social interactions unfold in their organization (Hofstede,
15 2011; **Taras, Kirkman, & Steel, 2010**).

16 Rybowskiak and colleagues (1999) have suggested that Hofstede's (1984) cultural factors
17 could influence the way employees deal with errors and learn from them. As well, Gelfand
18 and colleagues (2011) suggested that some cultural variables (e.g., uncertainty avoidance and
19 power distance, among others) might affect employees' attitudes and beliefs about errors, and
20 thereby contribute to the occurrence of errors.

21 Consequently, the third aim of this study is to further examine the error orientation
22 conceptualization by testing the relationships among its dimensions and cultural factors. We
23 specifically focused on the role played by two prominent cultural factors proposed by

1 Hofstede (1984, 2001) –power distance and uncertainty avoidance– which the literature has
2 highlighted as particularly relevant with respect to errors (Gelfand et al., 2001).

3 Power distance refers to the extent to which people expect and accept an unequal
4 distribution of power between levels in the social system (Hofstede, 1984). Organizations
5 with high power distance tend to rely on hierarchically stratified structures, more centralized
6 decisions and autocratic leadership (Hofstede, 2001). This type of work environment often
7 results in a reduction of the lines of communication between operational personnel and
8 management and affects decision-making processes (e.g., managers do not seek to ensure
9 employees’ participation, disagreement cannot be expressed) (Bialas, 2009; Hofstede, 1984;
10 Liu, Yang, & Nauta, 2013).

11 To test the error orientation multidimensional model, we will analyze whether the
12 different error orientation facets have specific relationships with cultures supporting power
13 distance. We hypothesize that the communication regarding threatening topics, such as the
14 occurrence of an erroneous action, will be more problematic when these cultures are strong.
15 For instance, employees may feel they receive little to no support when an error happens
16 (Cole, Carter, & Zhang, 2013) and be reluctant to report errors (Shimizu & Hitt, 2011). Thus,
17 we propose employees will shun away from communicating with others and evade asking for
18 support in the case of errors (that is, a significant and negative power distance–
19 *communication* relationship).

20 Further, when working in cultural contexts with high levels of power distance, employees
21 tend to avoid seeking feedback about their performance related to errors (König et al., 2007)
22 and to turn a blind eye on their colleagues’ or own errors (Zotzmann et al., 2019). They do not
23 engage in extra-role behaviors (such as discussion of faulty work procedures or other
24 interpersonally threatening situations) nor they question their leaders’ behaviors and decisions

1 (Helmreich, Wilhelm, Klinec, & Merritt, 2001; Liu et al., 2013). Thus, we suggest that
2 employees will tend to deny their own responsibility for wrong actions and are more likely to
3 cover them up (that is, a significant and positive power distance–*covering up* relationship).

4 In high power-distance organizational cultures, employees also share the belief that errors
5 can be threatening events (e.g., expecting that, when an error occurs, they could be punished
6 for their flaws or losing face or even their jobs), therefore being highly aware of their possible
7 occurrence and feeling feared or shamed when an error happens. Thus, we hypothesize that in
8 these contexts, employees will demonstrate a higher general negative attitude towards errors
9 (that is, a significant and positive power distance–*anticipation* relationship) and stronger
10 negative emotions related to error occurrence (that is, a significant and positive power
11 distance–*strain* relationship).

12 Overall, an erroneous event enhances employees' strain and their tendency to counteract
13 the erroneous action by denying, hiding or underestimating personal responsibility for its
14 occurrence (König et al., 2007). This, in turn, exerts detrimental implications on
15 communicative and decisional processes (Hofstede, 1984) and activates a “vicious cycle” that
16 leads to persisting in errors and hindering learning from them (Catino, 2008; Edmondson &
17 Lei, 2014). Thus, we further hypothesized that high power-distance cultures shape employees'
18 negative attitudes toward errors, paving the way to more frequent work errors (that is, error
19 orientations will mediate the power distance–*errors* relationship).

20 Uncertainty avoidance defines the way the members of an organization feel when in
21 unknown or ambiguous situations (Hofstede, 1984). Employees working in cultures with high
22 levels of uncertainty-avoidance are guided by the desire for predictability and structure in
23 their work and relationships (Hofstede, 2001). They are also more risk averse in their
24 decision-making (Ladbury & Hinsz, 2009) and attempt to minimize the anxiety of the

1 unknown by establishing well-defined policies, formal rules and laws to impose certainty to
2 various domains of life (Gelfand et al., 2011). This leads to increased control by closely
3 monitoring the environment, placing emphasis on error awareness and prevention, adhering to
4 well-structured routines and standard operating procedures (Mohamed, Ali, & Tam, 2009).

5 Overall, the literature suggests that high levels of uncertainty avoidance may imply a loss
6 of flexibility that might reduce the resilience of the system when something unexpected
7 happens (Gelfand et al., 2011). Thus, the occurrence of an error –which by definition is an
8 unexpected outcome due to an alteration of planned procedure or usual routine– might
9 represent a serious stressor in these cultural contexts. We hypothesize that employees, when
10 working in strongly uncertainty-avoidant cultures, will be oriented towards low risk taking
11 (that is, a significant and negative uncertainty avoidance–*risk* relationship) and may feel
12 highly strained when an error occurs (that is, a significant and positive uncertainty avoidance–
13 *strain* relationship).

14 On the other hand, cultures high in uncertainty avoidance might support positive coping
15 strategies aimed at the early detection of errors, effectively recovering and learning from
16 them. Specifically, we hypothesized that employees tend to preserve clear and effective
17 operative standards to monitor their work performance for error refrain, and to quickly detect
18 them once they occur (that is, a significant and positive uncertainty avoidance–*thinking*
19 relationship). In these cultures, employees also feel free to communicate with colleagues to
20 solve negative consequences (Baker & Carson, 2011), being more oriented towards asking for
21 help (that is, a significant and positive uncertainty avoidance–*communication* relationship).
22 They will be also more committed to quickly managing errors to avoid worse consequences
23 (that is, a significant and positive uncertainty avoidance–*competence* relationship). Further,
24 while in these cultures employees adhere to established norms, rules, procedures and routines,

1 they also flexibly adapt or change them to acquire a safer position in the future. Thus, we
2 propose that they are likely to believe errors may have an informative value to avoid future
3 errors (that is, a significant and positive uncertainty avoidance–*learning* relationship).

4 Overall, we hypothesize that uncertainty avoidant cultures, shaping employees' positive
5 attitudes toward errors, are associated with lower levels of work errors (that is, error
6 orientations will mediate the uncertainty avoidance–*errors* relationship).

7 The hypothesized model is summarized in Figure 1.

8 [INSERT-FIGURE-1-ABOUT-HERE]

9

10

Method

11 *Participants and procedures*

12 Participants included 443 Italian employees. Their mean age was 44.25 years (SD=
13 11.58), and 43.6% were males. About 50.3% of the sample had a high school degree, while
14 35.5% had a university degree or more (9.5%). They worked for their current organization for
15 an average of 15.27 years (SD= 11.41) and had a mean job tenure of 19.70 years (SD= 11.45).
16 With regard to their job position, 11.5% were managers; 27.9% white-collar workers; 27.3%
17 specialized technicians; and 32.3% blue-collar workers.

18 Data were collected by students as part of their bachelor's thesis, using a convenience
19 sampling procedure. To ensure variability, each student approached between 10 and 30
20 employees, which resulted in a sample drawn from very heterogeneous sectors, type and size
21 (Table 3). Participants voluntarily participated in the study and did not receive any kind of
22 reward, financial or otherwise. Each participant received the questionnaire in a blank
23 envelope and a presentation letter, which contained a brief description of the research, its

1 main objectives, and a guarantee for the confidentiality of their responses. The ethic
2 committee of the department to which one of the authors is affiliated approved the study.

3 [INSERT-TABLE-3-ABOUT-HERE]

4 5 **Measures**

6 *Error orientation* was measured by the 37-item Error Orientation Questionnaire (EOQ)
7 by Rybowskiak and colleagues (1999). The EOQ measures the following eight facets: *error risk*
8 *taking* (4 items); *thinking about errors* (5 items); *error communication* (4 items); *error*
9 *competence* (4 items); *learning from errors* (4 items); *error anticipation* (5 items); *error*
10 *strain* (5 items); and *covering up errors* (6 items). Items are listed in Table 6. Each item asked
11 to what extent it applied to them, on a 5-point Likert scale ranging from 1= *not at all* to 5=
12 *totally*. Items were translated in Italian using the back-translation method. Specifically, in a
13 first step two of the authors independently translated the items. Next, authors discussed the
14 individual solutions. Since no relevant problem emerged, they agreed on the most appropriate
15 version and the final wording. Because the measurement model (CFA) of this scale is one of
16 the research questions that includes also testing alternative models, it is reported in the result
17 section.

18 *Power distance* and *uncertainty avoidance* (Hofstede, 1981) were assessed adopting the
19 scale developed by Dorfman and Howell (1988). In particular, rather than asking how the
20 culture should be (values), following Hofstede's suggestions for tapping organizational
21 cultures, we asked how they actually perceive their organizational culture in practice. Power
22 distance was measured by a 5-item scale assessing the extent to which the members of an
23 organization accept a vertical distribution of power (e.g., "Managers make most decisions
24 without consulting subordinates"). Similarly, uncertainty avoidance was assessed by a 5-item

1 scale which describes the degree the organization has structured, well-defined and formalized
 2 procedures and routines aimed to ensuring the predictability and stability of the work
 3 experience (e.g., “We have job requirements and instructions spelled out in detail, so that
 4 employees always know what they are expected to do”). Responses were given on a 5-point
 5 Likert scale ranging from 1= *not at all true* to 5= *completely true*. Preliminary CFA supported
 6 the dimensionality of the scale ($\chi^2_{(33)}= 113.66$, $p < .01$; CFI= .95; RMSEA= .074 (CI = .059–
 7 .089), $p < .01$; SRMR= .052). Loadings ranged from .49 to .85 and the two dimensions correlated
 8 with each other (i.e., .15).

9 *Work errors* were assessed using a scale generated *ad hoc* for this study to detect
 10 employees’ perceptions about the occurrence of some typical errors performed within daily
 11 work activities. The scale was designed by using both top-down and bottom-up approaches.
 12 Specifically, we drew on Reason’s (1990) error classical taxonomy, which distinguishes
 13 between wrong actions due to the incorrect execution of a correct action sequence (i.e., *slips*,
 14 operative errors; and *lapses*, omission errors) and wrong actions due to the correct execution
 15 of an incorrect rule or procedure (i.e., *mistakes*, interpretation errors that result from
 16 incomplete or outdated knowledge, or using incorrect information regarding which
 17 procedures apply). We operationalized this conceptualization by using 15 in-depth interviews
 18 conducted with employees from different sectors, through the critical interview method
 19 (Flanagan, 1954). Based on both the interviews and Reason’s categorization, a list of 15 items
 20 was produced. Afterwards, one of the authors and an external expert independently assigned
 21 items to related dimensions and compared their rate of agreement, reducing the list to 7 items
 22 **through semantic evaluation**. The final list included items related to Reason’s (1990) basic two
 23 dimensions: *slips/lapses*; and *mistakes* due to knowledge or rule-based errors. Items are listed
 24 in Table 4. Participants were asked to indicate, according to their own individual perceptions,

1 the frequency they made the listed errors (“During daily work activities, how often do the
 2 following happen to you?”) rating items on a Likert scale ranging from 1= *never or almost*
 3 *never* to 5= *always or almost always*. Preliminary CFA conducted by using a cross validation
 4 approach supported the dimensionality of the scale. In particular, we randomly split the sample
 5 in two halves and conducted the CFA on the two samples independently. Results showed the
 6 adequacy of the two-factor model (Sample 1: $\chi^2_{(12)}= 20.84$, $p<.01$; CFI= .98; RMSEA= .058
 7 (CI = .000–.099), $p=.33$; SRMR= .031; Sample 2: $\chi^2_{(12)}= 21.66$, $p<.01$; CFI= .98; RMSEA=
 8 .059 (CI = .011–.098), $p=.31$; SRMR= .030), also when compared with an alternative one-
 9 factor model (Total sample two-factor model: $\chi^2_{(12)}= 33.25$, $p<.01$; CFI= .98; RMSEA= .063
 10 (CI = .038–.089), $p=.18$; SRMR= .025; Total sample one-factor model: $\chi^2_{(13)}= 51.06$, $p<.01$;
 11 CFI= .93; RMSEA= .113 (CI = .081–.146), $p<.01$; SRMR= .045). Loadings from the CFA on
 12 the total sample ranged from .56 to .76 and the two dimensions correlated with each other .76.

13 Descriptive statistics and internal consistency for all the scales are reported in Table 7.

14 ***Data analysis***

15 In order to examine the dimensionality of the error orientation questionnaire, we tested
 16 and compared the hypothesized models using a confirmatory factor analysis (CFA) approach.
 17 Akaike Information Criteria (AIC), Bayesian information criterion (BIC) and the log-
 18 likelihood function were used to compare the alternative factorial models. In addition, Chi
 19 square, Root Mean Square Error of Approximation (RMSEA), Comparative Fit Index (CFI)
 20 and Standardized Root Mean Square Residual (SRMR) were also considered to examine the
 21 fit of each model. These fit indices were evaluated considering the following cutoff criteria:
 22 CFI 0.90 or greater (Hu & Bentler, 1999); RMSEA up to 0.06 and a stringent upper limit of
 23 .07 (Hu & Bentler, 1999; Steiger, 2007); SRMR up to 0.08 (Hu & Bentler, 1999) as indicating
 24 a good fit. Internal consistency of the scales was examined considering both Cronbach’s alpha

1 and the factor score determinacy coefficients. Discriminant validity was then examined by
 2 testing a full structural equation model (SEM) considering both power distance and
 3 uncertainty avoidance as independent variables of the error orientation dimensions, and
 4 slips/lapses and mistakes as the dependent variables. Preliminary to the examination of the
 5 hypothesized structural model (Figure 1), we tested the adequacy of the measurement model
 6 (Bollen, 1989), followed by a comparison with an alternative one-factor model. This allowed
 7 a check of the common method bias (Podsakoff, MacKenzie, Lee, & Podsakoff, 2012). In
 8 addition, when testing the SEM, we defined a common latent variable to take into account the
 9 fact that all items were measured using only one source of information. Finally, we tested the
 10 indirect effects of cultural factors on errors through error orientation by using the indirect
 11 effect test implemented in Mplus. For each of the effects, the bootstrapped confidence
 12 intervals were computed.

13 **Results**

14 ***Dimensionality of the Error Orientation***

15 As shown in Table 5, the model supporting the eight-facet conceptualization by Rybowskiak
 16 and colleagues (M5), showed the best fit to the data. An inspection of the modification
 17 indices revealed that one source of misfit was due to three significant error covariances
 18 (STR5 with STR2, CPT1 with CPT3, and TNK5 with TNK6). Hence, we allowed correlating
 19 the residuals of the three pairs of items, since they refer to specific content (respectively,
 20 items STR5 and STR2 refer to being worried and afraid of doing something wrong; items
 21 CPT1 and CPT3 refer to feeling competent to correct a mistake; and items TNK5 and TNK6
 22 refer to thinking thoroughly about an error that occurred). The fit indices of the revised
 23 model were good with the exception of the CFI that was lower than .90 ($\chi^2 = 1418$, $df = 598$,
 24 $p < .001$; CFI = .86; RMSEA = .055 (CI = .052–.059), $p < .05$; SRMR = .066). Results showed

1 that all of the loadings were significant and higher than .30 with the exception of one item of
 2 error anticipation (ANT5) that showed a loading of .25 (Table 6).

3 As shown in Table 7, most of the error orientation dimensions correlated with each other.
 4 Specifically, positive dimensions were positively related (*risk, thinking, communication,*
 5 *competence, learning*) and the negative ones as well (*anticipation, strain, covering up*), thus
 6 confirming a common underlying valence, in line with the dichotomic model of attitudes.
 7 However, results showed an unexpected pattern of correlations between negative and positive
 8 dimensions, because only *covering up* negatively correlated with all of the positive error
 9 orientation facets. This negative relationship did not emerge among the other dimensions:
 10 *anticipation*, although expressing a negative attitude toward errors, correlated positively with
 11 all of the positive error orientation facets; and *strain* correlated negatively with *competence*,
 12 but had no significant relationship (*risk-taking, communication* and *learning*) or even a
 13 positive relationship (*thinking*) with the positive EOQ dimensions. Thus, the two negative
 14 cognitive (*anticipation*) and emotional (*strain*) attitudes, although positively related to the
 15 negative behavioral intentions toward errors (*covering up*), also showed a positive association
 16 with positive attitudes.

17 Finally, Cronbach’s alpha analysis supported good internal consistency for all facets,
 18 although only sufficient for *error anticipation* (Table 6).

19 [INSERT-TABLE-4-ABOUT-HERE]

20 [INSERT-TABLE-5-ABOUT-HERE]

21 [INSERT-TABLE-6-ABOUT-HERE]

22 ***Discriminant validity***

23 The measurement model resulted in a good fit: $\chi^2_{(1307)} = 2,529.7, p < .01; CFI = .87;$
 24 $RMSEA = .046$ (90% C.I. = .043–.048), $p = 1.00; SRMR = .058$, whereas results of the one-

1 factor model showed a poor fit to the data: $\chi^2_{(1373)} = 7,122.2, p < .001, CFI = .37, RMSEA = .097$
 2 $(90\% C.I. = .095-.099), p = .001; SRMR = .125$. This suggests the absence of common method
 3 bias, **supported** also by the significant chi-square difference test between the two models ($p <$
 4 $.001$). However, in order to take into account the possible common method bias, the model
 5 was estimated by including the common latent factor. The model fits the data well with the
 6 exception of the CFI that was lower than .90 ($\chi^2_{(1323)} = 2571.291; p < .001; CFI = .86; RMSEA =$
 7 $.046 (CI = .043-.049), p = .99; SRMR = .062$). Results of this model (Figure 2) showed that
 8 power distance, as hypothesized, was significantly related to the negative facets of error
 9 orientation. Specifically, the more the organizational culture lacked participation and had an
 10 unequal distribution of power, the more employees felt strained when they made errors
 11 (*strain*: .24, $p < .001$), and tended to hide or deny them (*covering up*: .21, $p < .001$). They also
 12 tended to not communicate with teammates about errors nor seek help and support from them
 13 (*communication*: -.27, $p < .001$). The model also showed the hypothesized relationships
 14 between uncertainty-**avoidant** cultures and EOQ facets. Indeed, the more employees valued
 15 their organizational culture oriented towards enhancing predictability and reducing ambiguity,
 16 the more employees carefully analyzed mistakes that occurred (*thinking*: .37, $p < .001$),
 17 promptly corrected them (*competence*: .33, $p < .001$), told others about them and relied on
 18 colleagues for help (*communication*: .27, $p < .001$) and used negative feedback to improve in
 19 the future (*learning*: .18, $p < .001$). They also felt more strained when an error occurred
 20 (*strain*: .10, $p < .05$). *Risk-taking* resulted unrelated (.08, $p = .278$).

21 Furthermore, results showed that two positive dimensions, *competence* and
 22 *communications*, were related to error reduction (specifically, *competence*–mistakes: -.26;
 23 $p < .001$; *competence*–slips/lapses: -.76; $p < .001$; *communication* –mistakes: -.16; $p < .05$).
 24 Conversely, the positive *risk-taking* dimension was positively related to errors (*risk*–

1 slips/lapses: .27; $p < .001$). Anyhow the positive *thinking*–slips/lapses relationship should not
 2 be interpreted; indeed, given the nonsignificant correlation between these two variables and
 3 the high correlation of thinking with the other EOQ facets, it is possible that the significant
 4 beta coefficient is a statistical artefact of the regression. Conversely, the two *anticipation* and
 5 *covering up* negative dimensions were positively related to errors (*anticipation*–mistakes: .39;
 6 $p < .001$; *covering up*–slips/lapses: .19; $p < .001$), whereas *strain* was not. The model also
 7 showed that power distance was directly associated with both slips and mistakes
 8 (respectively, .22 $p < .000$, and .14 $p < .05$). Results of the indirect effects showed that power
 9 distance is associated with slips through *covering* ($\beta = 0.038$, $p < .05$) and uncertainty
 10 avoidance is associated with both slips and mistakes through *competence* (respectively, $\beta = -$
 11 .25 $p < .01$; $\beta = -.086$ $p < .01$). Overall, the model explained 37% of the variance of *slips* and
 12 25% of *mistakes*.

[INSERT-FIGURE-2-ABOUT-HERE]

Discussion

16 This paper aimed to contribute to the error orientation conceptualization by providing
 17 theoretical anchors to its multidimensionality. The test of alternative models showed that the
 18 model incorporating the stress theory with the attitude theory had a better fit than the more
 19 parsimonious ones. This model overcomes the positive-negative dichotomy often adopted by
 20 scholars, supporting the complex eight-facet error orientation proposed by Rybowskiak and
 21 colleagues (1999). Specifically, results from the measurement model showed that all eight
 22 dimensions contributed to the construct definition, the weaker ones included. Indeed, the
 23 *error competence* dimension proved to have adequate internal reliability, similar to that of the
 24 Dutch version by Rybowskiak and colleagues, but in contrast to the lower reliability found in

1 their English version (Rybowiak et al., 1999) and in other studies (Schell & Conte, 2008).
2 Also *error anticipation*, a dimension seldom used in the literature or deleted because of poor
3 reliability, demonstrated sufficient psychometric properties in the present study.

4 This finding is also supported by correlations among error orientation dimensions, that
5 showed some unexpected patterns, suggesting that merging all of the negative dimensions in a
6 single approach would lose informative value. Indeed, the *anticipation* and *strain from error*
7 appraisal dimensions, although expressing negative attitudes toward errors, were not related
8 to the positive error orientation facets. This is in line with some empirical evidence suggesting
9 that *strain* and *covering up* could tap separate processes that do not conceptually coincide
10 neither lead to the same outcomes (see van Dyck et al., 2005). We propose that strain could
11 have a nonlinear relationship with the positive facets, since this emotional dimension,
12 although eliciting negative feelings, may contribute not only to emotion-focused strategies,
13 but also to problem-focused strategies. Future research should verify a possible interactive
14 contribution of strain to the adoption of different coping strategies, or explore boundary
15 conditions that turn strain toward problem-focused rather than emotion-focused coping
16 strategies. For instance, the psychological safety climate among teammates could moderate
17 the *strain*–learning relationship (Edmondson & Lei, 2014).

18 Overall, the model based on the twofold frame is consistent with the stress theory,
19 acknowledging the specificity of the appraisal and coping processes. **It is also** in line with the
20 tripartite view of attitudes, which holds that the cognitive, affective and behavioral
21 orientations represent conceptually distinct components that, although related to the same
22 underlying attitude, express different categories of psychological significance and are not
23 completely redundant (Ajzen, 1989).

24 The present results also allow a better understanding of the role of error orientation facets

1 in relation to possible cultural factors and error outcomes. In general, they provide some initial
 2 evidence consistent with the well-established relationship between positive coping orientations
 3 towards errors (*communication, competence*) and error reduction. Conversely, employees who
 4 tend to positively appraise errors, assuming that making errors is an inevitable *risk* to achieve
 5 work results, showed a positive relationship with errors. This facet expresses openness and
 6 flexibility towards errors and may imply an underestimation of danger from wrong actions and
 7 lower monitoring of one's own behaviors, thus paving the way to errors (Horvath & Zuckerman,
 8 1993).

9 These results further add to the literature providing empirical support to the overlooked
 10 negative orientation–errors relationship. Specifically, employees who tend to adopt a negative
 11 appraisal about errors by expressing pessimistic expectations (*anticipation*) and those who tend
 12 to adopt covering up emotion-focused strategies and fear being blamed when committing an
 13 error (*covering up*), make more errors.

14 It is worth noting that, although all of these relationships are consistent with our hypotheses,
 15 some relationships were not significant. Indeed, cognitive and emotional facets were not related
 16 to errors. This seems to be in line with the attitude conceptualization by Ajzen (1989),
 17 according to which the behavior component of attitudes is directly related to actual responses
 18 (namely, error reduction/increase), whereas cognitive and affective attitudes may be considered
 19 distal antecedents. Future longitudinal studies should test a model based on the causal-chain
 20 perspective suggested by Ajzen (1989), verifying whether beliefs and affect lead to the intention
 21 to behave which, in turn, determine actual behavior (i.e. errors).

22 The need for a complex conceptualization of error orientation is further supported by
 23 findings related to the relationship of its facets with Hofstede's cultural factors. Consistent with
 24 our hypotheses, employees working in high uncertainty-avoidance cultures were more oriented

1 to cope with errors. Thus, the desire for predictability typical of these cultural models enhances
 2 employees' tendency to adopt problem-focused strategies in order to avoid larger negative
 3 consequences and their repetition in the long run (secondary prevention), although enacting
 4 employees' negative affect (*strain*) toward undesirable events. This result also adds to the
 5 uncertainty avoidance literature, supporting conceptualizations of this cultural feature regarding
 6 its possible adaptive function, rather than being strictly oriented to predictability (Baker &
 7 Carson, 2011; Schneider & De Meyer, 1991). The hypothesized uncertainty avoidance–*risk*
 8 negative relationship was not supported.

9 Similarly, power distance cultures **were** significantly and positively related to employees'
 10 negative attitudes toward errors. This means that employees holding a perception of
 11 imbalanced power relationships among teammates are more likely to experience a negative
 12 emotional appraisal, **feel** shamed or worried about being blamed (*error strain*) and **tend** to deny
 13 or hide their responsibility for errors (*covering up*). They also tend to avoid *communicating*
 14 about their own errors and refraining from asking teammates for help (Gelfand et al., 2011; Liu
 15 et al., 2013). The hypothesized power distance–*anticipation* positive relationship was not
 16 supported. Results also showed a direct relationship between power distance and errors.

17 The model, on the whole, partially supported the hypothesized relationships between
 18 cultural factors and error orientation. Indeed, most dimensions were related to the two cultural
 19 factors, except uncertainty avoidance–*risk* and power distance–*anticipation* relationships.
 20 Some scholars asserted that error orientation is a malleable personal construct that can be
 21 shaped by social contexts (Gelfand et al., 2011; Huish & Poropat, 2008). Findings of our study
 22 highlight that coping dimensions seem to be influenced by cultural context, whereas appraisal
 23 dimensions are not. We may suppose that the *risk* and *anticipation* non-significant
 24 relationships could be due to their general focus (respectively, believing that it is better to err

1 rather do nothing, and expecting that something will go wrong when working) rather than a
2 focus on a specific work-error experience. In other words, results suggest that organizational
3 culture do not influence the generalized orientations through which individuals interpret and
4 evaluate how threatful errors may be, whereas it seems to change individual level of error
5 orientations when they are related to coping intentions. Nonetheless, future studies are needed
6 to provide stronger empirical support for these preliminary findings, for instance through a
7 multilevel or longitudinal design, that would allow to test causality relationships.

8 Overall, the composite patterns of relationships between the two cultural factors and the
9 error orientation dimensions underline the usefulness of considering a multidimensional
10 structure for this construct and suggest that merging EOQ's different facets in an overall
11 positive/negative dimension could be misleading, above all when analyzing their relationship
12 with other variables.

13 Finally, the model tested a mediating effect of cultural factors on errors through error
14 orientation, showing a total indirect effect for both uncertainty avoidance and power distance.
15 Thus, cultural norms, practices and shared believes about errors are variously related to
16 different attitudes toward errors, that in turn relate to erroneous behaviors. Future research
17 should explore whether these different relationships could outline specific patterns that, from
18 cultural factors, contribute to enhance/reduce the probability that employees make errors at
19 work, by shaping their error orientation. For instance, following Ajzen and Fishbein's (1980)
20 theory of reasoned action, we could propose that individual attitudes toward errors represent
21 the underlying motivation to perform an action, and that social norms (i.e., believes and
22 perceptions shared in relevant groups, such as organizational or professional contexts) also
23 contribute to how employees will actually engage in a behavior, both directly exerting a

1 pressure to correctly/erroneously behave, and indirectly affecting it through their behavioral
2 intention attitude.

3 This study also makes a cross-cultural contribution to the EOQ's validation given that, as
4 far as we know, it is the first study conducted in a Latin European country. Indeed, the
5 national culture in our study differs from the Germanic or Anglo countries where most studies
6 on errors have been conducted, being Italy a country where a blame-guilt culture is widespread,
7 power distance with authorities are stronger, leadership style is less participative and tolerance
8 for ambiguity and uncertainty is lower (Catino, 2008; House, Hanges, Javidan, Dorfman, &
9 Gupta, 2004; Lorenzoni & Lewis, 2004). In this way, we embraced Hofstede's (1984) suggestion
10 to enhance cross-cultural research on his dimensions. Anyhow we focused on one single culture,
11 thus further studies considering additional countries (Zotzmann et al., 2019) or specific
12 organizational or professional cultures are needed to check whether errors could be conceived of
13 as more troublesome than in other cultural contexts.

14 ***Practical implications***

15 As errors represent an unavoidable part of an individual's work experience, their role in
16 fostering organizational learning is widely recognized (Frese & Keith, 2015; Edmondson & Lei,
17 2014). Results of this study highlight the importance of cultural factors in shaping employees'
18 attitude toward errors, affecting their awareness and the propensity to learn from them or not.
19 From a practical point of view, this suggests that management should encourage a low power
20 distance culture, where mistakes are not blamed or penalized, while also encouraging
21 employees' awareness about feedback (even when negative) regarding their work or promoting
22 communication about mistakes (König et al., 2007), also exerting a modelling role on how to
23 deal with errors (Farnese et al., 2018). As well, a cultural context oriented to minimize the
24 anxiety of ambiguous situations does not seem to lead to a loss of flexibility when an

1 unexpected event happens, rather it seems to enhance the resilience of the system by
2 activating effective coping strategies (Baker & Carson., 2001). Thus, a work environment
3 designed to establish well-defined policies and formal rules could help not only in preventing
4 errors, but also in reducing their negative consequences after a wrong action and in increasing
5 the likelihood of learning from them, making the organization able to adopt a twofold error
6 handling approach (Frese & Keith, 2015; Catino, 2008).

7 The present findings may also be of relevant use in training projects (Amini & Mortazavi,
8 2012; Frese & Keith, 2015; Keith & Frese, 2005). Raising awareness about preferred personal
9 attitudes, and recognizing their advantages and disadvantages, may help instructors develop
10 interventions that enable trainees to gain confidence in their error-coping competence and to
11 perform more effectively, thereby benefiting both the individual and the organization.

12 *Limitations and directions for future research*

13 Some limitations of the present study need to be addressed. Firstly, the data were
14 obtained through a self-report questionnaire, raising concerns regarding the eventual common
15 method variance issues. Although the hypotheses were tested while controlling for the
16 common latent factor, the findings of this study must be interpreted cautiously given the
17 limitations of the self-report nature of our data, due for instance to the risk of underestimation
18 of self-assessed work errors or to an overestimation of own error competence or learning
19 capability. Further, the cross-sectional study design precludes the ability to make statements
20 of cause and effect, thus additional research would benefit from longitudinal designs to test
21 the process we hypothesized **or** alternative ones. For instance, we assumed that individual
22 error orientation leads employees to make less/more errors, but it is also plausible that the
23 frequency of errors that an employee makes can influence their attitude toward them (e.g.,
24 that employees who make a lot of mistakes tend to cover them up or to be more aware that

1 mistakes can occur or, in the opposite case, to perceive themselves as capable in detecting or
2 correcting errors promptly). Similarly, drawing on Lazarus and Folkman's (1984)
3 transactional stress theory, we hypothesized that individuals' orientations toward errors are
4 context-sensitive attitudes, thus their level may change also on the basis of the organizational
5 culture employees are embedded in. However, we could also argue that bottom-up emergent
6 processes might contribute to shape some cultural features (e.g., similar professional
7 backgrounds can lead to shared beliefs about risk-taking or the value of learning from
8 errors). In addition, to better understand the error orientation sensitivity to contextual factors,
9 future research could also explore the interplay among factors at different levels, for instance
10 adopting a multicenter design or integrating the proposed model with other individual (e.g.,
11 work self-efficacy), interpersonal (e.g., trustworthiness in peers or supervisor, team
12 psychological safety climate), or organizational variables (e.g., safety climate).

13 Another limitation of this study is related to the representativeness of the sample, as the
14 data were obtained from a convenience sample, and not collected at the organizational level.
15 As such, case studies or multilevel studies could add to the literature. Moreover, **having based**
16 **this study only on one single culture, a comparing approach with employees from other cultures**
17 **is encouraged for future research (e.g., cross-national studies)**. Believing that error orientation is
18 a highly culturally sensitive construct, future cross-cultural research needs to be conducted.

19

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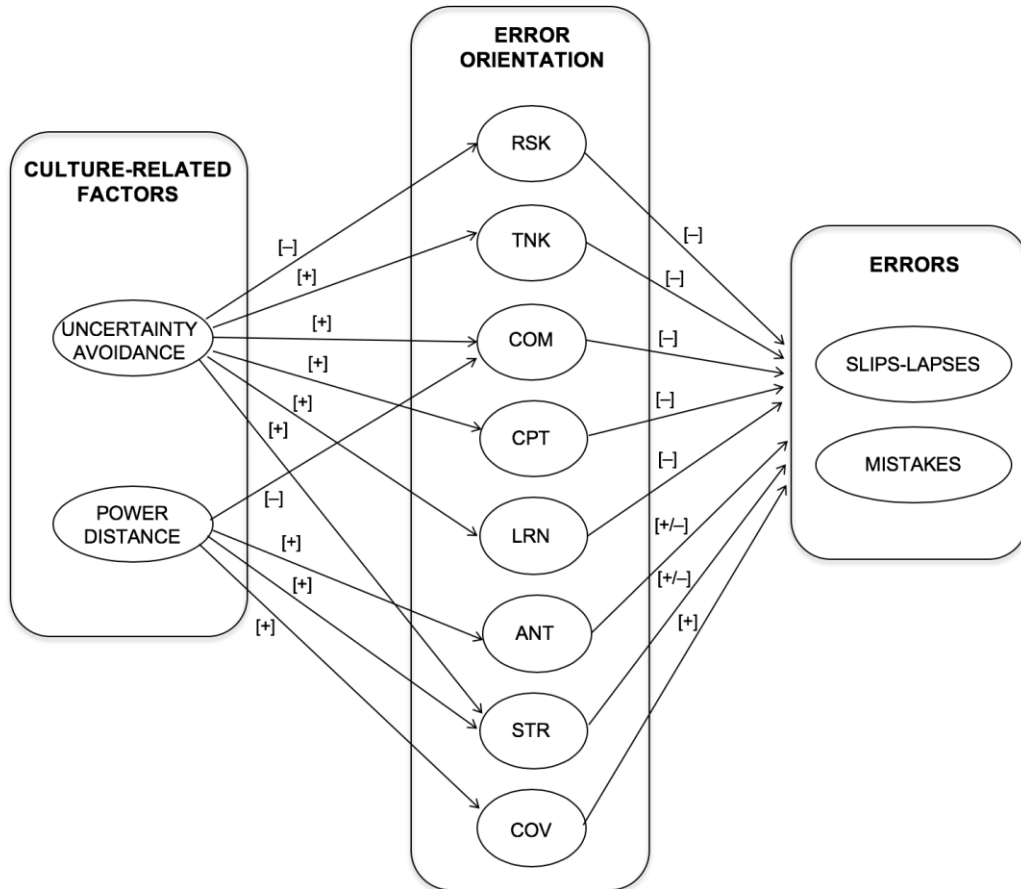
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6 *Acknowledgements:* We thank the anonymous reviewers for their careful reading of our
7 manuscript and their many insightful comments and suggestions.

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Figure 1. The hypothesized model and direction of relationships.

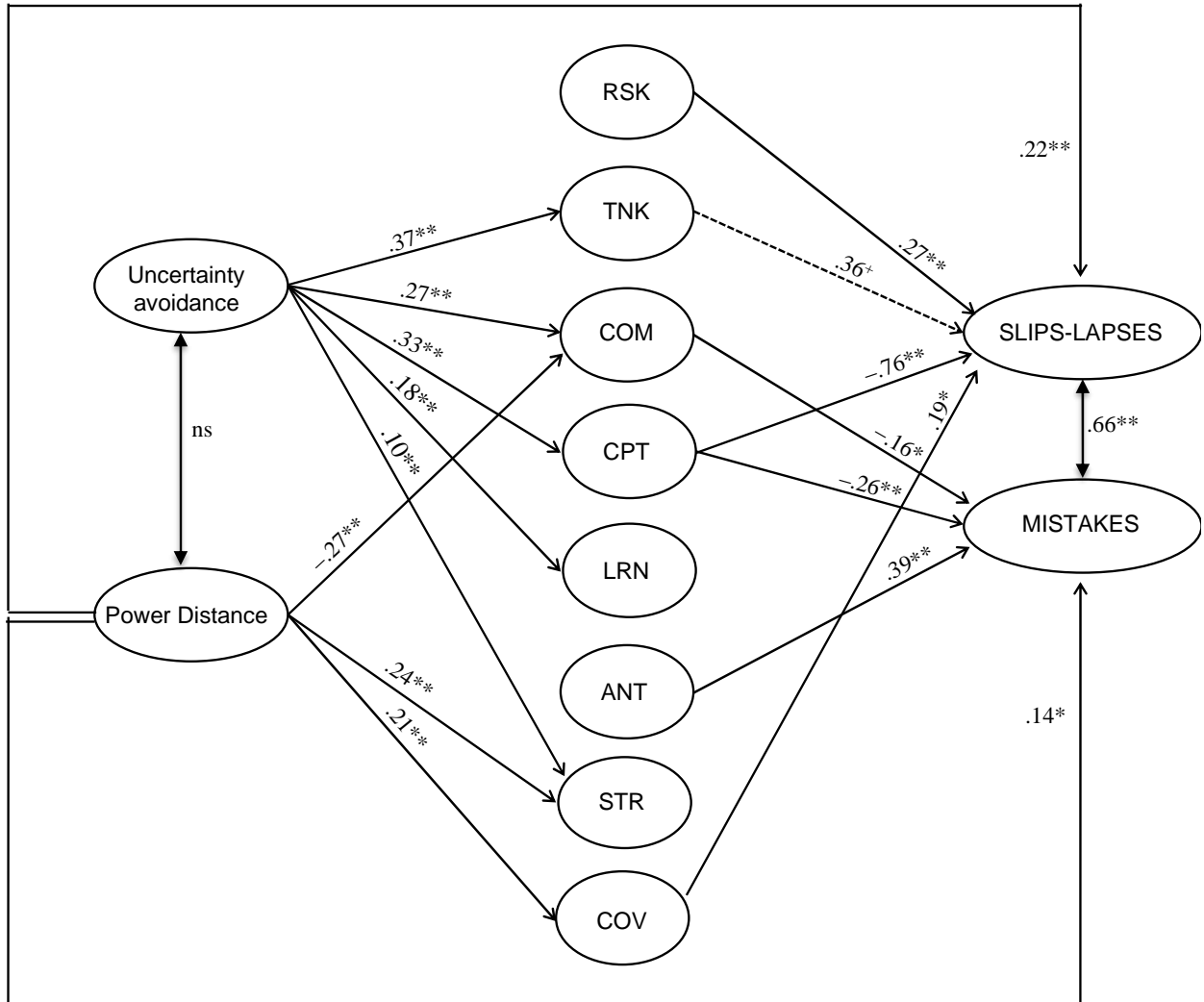


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Note: RSK= error risk taking, TNK= thinking about errors, COM= error communication, CPT= error competence, LRN= learning from errors, ANT= error anticipation, STR= error strain, COV= covering up errors.

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Figure 2. The tested model.



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5 *Note:* RSK= error risk taking, TNK= thinking about errors, COM= error communication, CPT= error
6 competence, LRN= learning from errors, ANT= error anticipation, STR= error strain, COV= covering up errors.

8 Please note that all the dimensions are latent measured by their indicators. In addition, the model includes the
9 common latent factor that has been estimated but not reported in the figure.

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Table 1. Summary of the studies using the EOQ's scales or variants (in chronological order).

Source	Theoretical dimensions								N dim.	EFA	CFA	Empirical factors	N fac.
	1 RSK	2 TNK	3 COM	4 CPT	5 LRN	6 ANT	7 STR	8 COV					
Rybowiak et al., 1999 (Study 1)	X			X	X	X	X	X	6	X	X	1= RSK; 4= CMP; 5= LRN; 6= ANT; 7= STR; 8= COV	6
Rybowiak et al., 1999 (Study 2)	X	X	X	X	X	X	X	X	8	--	X*	1= RSK; 2= TNK; 3= COM; 4= CMP; 5= LRN; 6= ANT; 7= STR; 8= COV	8
Fay & Frese, 2000	X								1	--	X***	1= RSK	1
Korsten et al., 2004	X	X	X	X	X	X	X	X	8	X***	--	7= stress caused by error; 2, 3, 4, 8= attitude of dealing with errors; 1= RSK (5 and 6 deleted)	3
Tjosvold et al., 2004		X	X		X		X	X	5	--	X***	2, 3= problem solving approach; 5= LRN; 7, 8= blaming approach	3
Keith & Frese, 2005					X		X		2	--	--	5= LRN; 7= STR	2
van Dyck et al., 2005 (Study 1)		X	X	X	X		X	X	6	X	--	2, 3, 4, 5= error management; 7, 8= error aversion	2
van Dyck et al., 2005 (Study 2)		X	X	X	X				4	--	--	2, 3, 4, 5= error management	1
Arenas et al., 2006	X		X				X		3	--	--	1= RSK; 3= COM; 7= STR	3
Hofmann & Mark, 2006		X	X					X	3	X	X***	2, 3, 8(rev) +other dimensions= safety climate	1
König et al., 2007			X						1	--	--	3= COM	1
Mark et al., 2007		X	X					X	3	--	--	2, 3, 8(rev) +other dimensions = safety climate	1
Tjosvold & Yu, 2007	X			X					2	--	--	1= RSK; 4= CPT	2
Harteis et al., 2008	X	X	X	X	X	X	X	X	8	X	--	1, 5= appraisal of mistakes; 2, 3= strategies to learn from mistakes; 7, 8= negative emotions regarding mistakes (4 and 6 deleted)	3
Schell & Conte, 2008				X			X		2	--	--	4= LRN; 7= STR	2
Carter & Beier, 2010					X				1	--	--	5= LRN	1
Cigularov et al., 2010		X	X	X	X				4	X	X***	2, 3, 4, 5= error management	1
Chughtai & Buckley, 2010			X						1	--	--	3= COM	1
Chang & Mark, 2011		X	X					X	3	X	--	2= TNK, 3= COM; 8(rev)= COV	3
Hetzner et al., 2011	X			X	X		X		4	--	--	1= RSK; 4= CPT; 5= LRN; 7= STR	4
Amini & Mortzavi, 2012	X	X	X	X	X	X	X	X	8	--	X***	1= RSK; 2= TNK; 3= COM; 4= CMP; 5= LRN; 6= ANT; 7= STR; 8= COV	8

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Baglin & Da Costa, 2012					X		X		2	X	--	5= LRN; 7= STR	2
Bauer & Mulder, 2013					X		X	X	3	--	X***	5= LRN; 7= STR; 8= COV	3
Casey & Krauss, 2013		X	X	X	X				4	X	X***	2, 3, 4, 5= error management	1
Leicher et al., 2013					X		X	X	3	--	X***	5= LRN; 7= STR; 8= COV	3
Putz et al., 2013		X			X		X		3	--	--	2= TNK; 5= LRN; 7= STR	3
Tulis, 2013			X					X	2	--	--	3= COM; 8= COV	2
Fruhen & Keith, 2014		X	X	X	X		X	X	6	--	--	2, 3, 4, 5= error management; 7, 8= error aversion	2
Steele-Johnson & Kalinoski, 2014					X				1	--	X***	5= LRN	1
Yan et al., 2014	X	X	X		X		X	X	6	--	--	1, 2, 3, 5, 7(rev), 8(rev)= error learning	1
Leicher & Mulder, 2016					X		X	X	3	--	X***	5= LRN; 7= STR; 8= COV	3
King & Beher, 2017	X	X	X	X	X	X	X	X	8	--	--	1, 2, 3, 4, 5= positive error management; 6, 8= negative error management; 7= strain	3
Rausch, Seifried & Harteis, 2017	X	X	X	X	X	X	X	X	8	--	--	1= RSK; 2= TNK; 3= COM; 4= CMP; 5= LRN; 6= ANT; 7= STR; 8= COV	8
Farnese et al., 2018		X	X	X	X				4	--	X***	2, 3, 4, 5= error management	1
Lauzier & Mercier, 2018					X		X			--	--	5= LRN; 7= STR	2
Zotzmann et al., 2019	X	X	X	X	X	X	X	X	8	--	--	1= RSK; 2= TNK; 3= COM; 4= CMP; 5= LRN; 6= ANT; 7= STR; 8= COV and: 1, 2, 3, 4, 5, 6, 7, 8= error orientation	8-1
<i>Frequency of each dimension's use</i>	13	19	22	17	26	9	22	19					

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2 * CFA conducted at item level separately on each dimension; ** CFA conducted at facet level; *** Factor analysis conducted including error orientation items and
3 other scales.
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5 *Note:* RSK=error risk taking, TNK= thinking about errors, COM= error communication, CPT= error competence, LRN= learning from errors, ANT= error
6 anticipation, STR= error strain, COV= covering up errors.
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Table 2. Summary of the tested models.

	Number of factors	RSK	TNK	COM	CPT	LRN	ANT	STR	COV
<i>Stress model framework</i>									
M1	#4	F1	F3	F3	F3	F3	F2	F2	F4
		Positive appraisal	Problem-focused strategy			Negative appraisal		Emotion-focused strategy	
M2	#4	F1	F3	F3	F3	F3	F2	F4	F4
		Positive appraisal	Problem-focused strategy			Negative appraisal	Emotion-focused strategy		
<i>Attitude theory framework</i>									
M3	#2	F1	F1	F1	F1	F1	F2	F2	F2
		Positive valence				Negative valence			
M4	#5	F1	F4	F4	F4	F1	F2	F3	F5
		Positive cognitive component	Positive behavioral component			Positive cognitive component	Negative cognitive component	Negative affective component	Negative behavioral component
<i>Rybowiak et al.'s model</i>									
M5	#8	F1	F2	F3	F4	F5	F6	F7	F8
		Positive appraisal (belief)	Problem-focused coping (problem set)	Problem-focused coping (social support)	Problem-focused coping (problem solving)	Problem-focused coping (planning)	Negative appraisal (belief)	Negative appraisal (affective)	Emotion-focused coping (deny)

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Legend: RSK= error risk taking, TNK= thinking about errors, COM= error communication, CPT= error competence, LRN= learning from errors, ANT= error anticipation, STR= error strain, COV= covering up errors.

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Table 3. Characteristics of the organizational contexts of the sample.

PRODUCTIVE SECTORS	n.	%
Culture (education, tourism, information)	54	12.2
Trade (food, other goods)	54	12.2
Health and social assistance	91	20.5
Construction and transportation	64	14.4
Services (financial and insurance, consultants)	62	14.0
Security and Army	11	2.5
Public administration and other public services	98	22.1
Others (call centers, cleaning companies)	9	2.0
TYPE		
Private sector	245	55.2
Public sector	183	41.4
Non-for-profit sector	15	3.4
SIZE		
Micro (<15 employees)	77	17.3
Small (16–50 employees)	51	11.5
Medium (51–500 employees)	118	26.6
Large (>500 employees)	197	44.6
GEOGRAPHICAL LOCATION		
Company nationally based, one office	147	33.1
Company nationally based, with local branches	227	51.1
International corporate	60	13.5
<i>Missing</i>	9	2.3
	Tot. 443	100 %

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Table 4. Work errors scale (items and descriptive statistics).

<i>Item</i>	<i>Mean</i>	<i>SD</i>	<i>Skewness</i>	<i>Kurtosis</i>	SLIPS/LAPSES <i>Loadings*</i>	MISTAKES <i>Loadings*</i>
1. Forget to perform a task	2.22	0.82	.176	-.557	.557	
2. Delay in the performance of a task	2.49	0.85	.062	-.489	.763	
3. Being distracted when working	2.82	0.88	-.331	-.120	.760	
4. Refer to incomplete or outdated knowledge to perform a task	2.29	1.00	.445	-.393		.662
5. Use an improper procedure	2.28	0.92	.466	-.069		.752
6. Make decisions not effective for our customers	2.17	0.92	.374	-.448		.754
7. Fail to fully comply with protocols, procedures, or guidelines	2.00	0.97	.756	-.052		.717

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* Results of the CFA

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Table 5. Results of the hypothesized factors models.

	Loglikelihood		Akaike (AIC)	Bayesian (BIC)	Sample-Size Adjusted BIC	Chi-Square			CFI	RMSEA			SRMR
	H0 Value	H1 Value				Estimate	DF	p		Estimate	90 Percent C.I.	p	
M1	-19791.063	-18447.216	39816.126	40296.126	39924.816	2687.694	623	.000	0.657	0.086	0.083 0.089	0.000	0.096
M2	-19780.762	-18447.216	39795.524	40275.523	39904.213	2667.091	623	.000	0.660	0.086	0.082 0.089	0.000	0.098
M3	-20119.190	-18447.216	40462.379	40921.866	40566.424	3343.947	628	.000	0.548	0.098	0.095 0.102	0.000	0.118
M4	-19566.382	-18447.216	39374.763	39871.173	39487.169	2238.331	619	.000	0.731	0.077	0.073 0.080	0.000	0.082
M5	-19218.700	-18447.216	38715.401	39285.656	38844.527	1542.968	601	.000	0.843	0.059	0.056 0.063	0.000	0.069

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Table 6. Labels, original items by Rybowski et al. (1999), items' translation in Italian (italics, in brackets) and factor loadings of the 8-factor Confirmatory Factor model.

<i>Label</i>	<i>Item</i>	<i>Loadings</i>
ERROR RISK TAKING		
RSK1	If one wants to achieve at work, one has to risk making mistakes. [<i>Se qualcuno vuole riuscire nel lavoro, deve rischiare di fare qualche errore</i>]	.618
RSK2	It is better to take the risk of making mistakes than to sit on one's behind. [<i>È meglio assumersi il rischio di compiere qualche errore, piuttosto che stare a guardare</i>]	.783
RSK3	To get on with my work, I gladly put up with things that can go wrong. [<i>Per andare avanti con il mio lavoro, accetto di buon grado che le cose che possano andare male</i>]	.687
RSK4	I'd prefer to err, than to do nothing at all. [<i>Preferisco sbagliare piuttosto che non fare nulla</i>]	.448
THINKING ABOUT ERRORS		
TNK1	After I have made a mistake, I think about how it came about. [<i>Dopo aver commesso un errore, penso a come sia accaduto</i>]	.652
TNK2	I often think: 'How could I have prevented this?' [<i>Spesso penso: Come avrei potuto prevenire questa cosa?</i>]	.696
TNK3	If something goes wrong at work, I think it over carefully. [<i>Se qualcosa a lavoro va storta, ci rifletto su attentamente</i>]	.617
TNK4	After a mistake has happened, I think long and hard about how to correct it. [<i>Dopo che è successo un errore, penso molto a lungo a come correggerlo</i>]	.731
TNK5	When a mistake occurs, I analyze it thoroughly. [<i>Quando mi capita un errore, lo analizzo a fondo</i>]	.657
ERROR COMMUNICATION		
COM1	When I make a mistake at work, I tell others about it in order that they do not make the same mistake. [<i>Quando faccio un errore a lavoro, lo dico ai colleghi in modo che non lo ripetano</i>]	.762
COM2	If I cannot rectify an error by myself, I turn to my colleagues. [<i>Se non riesco a porre rimedio a un errore da solo, mi rivolgo ai colleghi</i>]	.730
COM3	If I cannot manage to correct a mistake, I can rely on others. [<i>Se non riesco a correggere un errore, posso fare affidamento sugli altri</i>]	.719
COM4	When I have done something wrong, I ask others, how I should do it better. [<i>Quando ho fatto qualcosa di sbagliato, ho chiesto agli altri come poter migliorare</i>]	.547
ERROR COMPETENCE		
CPT1	When I have made a mistake, I know immediately how to correct it. [<i>Se ho fatto un errore, so immediatamente come correggerlo</i>]	.628
CPT2	When I do something wrong at work, I correct it immediately. [<i>Quando faccio qualcosa di sbagliato a lavoro, lo correggo immediatamente</i>]	.557

CPT3	If it is at all possible to correct a mistake, then I usually know how to go about it. [<i>Se è possibile correggere un errore, in genere io so come affrontare la cosa</i>]	.688
CPT4	I don't let go of the goal, although I may make mistakes. [<i>Non abbandono il mio obiettivo, anche quando mi capita di fare qualche errore</i>]	.380
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LEARNING FROM ERRORS		
LRN1	Mistakes assist me to improve my work. [<i>Gli errori mi sono d'aiuto per migliorare il mio lavoro</i>]	.792
LRN2	Mistakes provide useful information for me to carry out my work. [<i>Gli errori mi forniscono informazioni utili per svolgere il mio lavoro</i>]	.843
LRN3	My mistakes help me to improve my work. [<i>Gli sbagli mi aiutano a migliorare il mio lavoro</i>]	.820
LRN4	My mistakes have helped me to improve my work. [<i>Gli errori che ho compiuto mi hanno aiutato a migliorare il mio lavoro</i>]	.740
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ERROR ANTICIPATION		
ANT1	In carrying out my task, the likelihood of errors is high. [<i>Nello svolgere i miei compiti, la probabilità di fare errori è elevata</i>]	.612
ANT2	Whenever I start some piece of work, I am aware that mistakes occur. [<i>Ogni volta che inizio una nuova attività, sono consapevole che possono verificarsi degli errori</i>]	.398
ANT3	Most of the time I am not astonished about my mistakes because I expected them. [<i>La maggior parte delle volte non mi sorprendo dei miei errori perché me li aspettavo</i>]	.624
ANT4	I anticipate mistakes happening in my work. [<i>Prevedo gli errori che capitano nel mio lavoro</i>]	.505
ANT5	I expect that something will go wrong from time to time. [<i>Mi aspetto che qualcosa possa andare storto di tanto in tanto</i>]	.251
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ERROR STRAIN		
STR1	I find it stressful when I err. [<i>Mi sento stressato/a quando sbaglio</i>]	.647
STR2	I am often afraid of making mistakes. [<i>Sono spesso preoccupato/a di poter fare errori</i>]	.664
STR3	I feel embarrassed when I make an error. [<i>Mi sento in imbarazzo quando mi capita di fare un errore</i>]	.674
STR4	If I make a mistake at work, I 'lose my cool' and become angry. [<i>Se faccio un errore a lavoro, perdo la calma e mi arrabbio</i>]	.715
STR5	While working I am concerned that I could do something wrong. [<i>Mentre lavoro sono preoccupato/a di poter fare qualcosa di sbagliato</i>]	.493
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COVERING UP WITH ERRORS		
COV1	Why mention a mistake when it isn't obvious? [<i>Perché parlare di un errore quando non è evidente?</i>]	.631
COV2	It is disadvantageous to make one's mistakes public. [<i>Non è conveniente rendere pubblici gli errori di qualcuno</i>]	.580
COV3	I do not find it useful to discuss my mistakes. [<i>Non trovo utile discutere dei miei errori</i>]	.783

COV4	It can be useful to cover up mistakes. [<i>Può essere vantaggioso coprire gli errori</i>]	.578
COV5	I would rather keep my mistakes to myself. [<i>Preferisco tenere per me i miei errori</i>]	.630
COV6	Employees who admit to their errors, make a big mistake. [<i>I dipendenti che ammettono i propri errori fanno un grande sbaglio</i>]	.560

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2 **Table 7. Correlations among variables and their internal consistency (Cronbach's alphas in parentheses).**

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Error orientation's factors	Mean	SD	Skewness	Kurtosis	RSK	TNK	COM	CPT	LRN	ANT	STR	COV	ERR-S	ERR-M	PWD	UAV
1. RSK–Error risk taking	3,82	0.63	-.281	-.327	(.716)											
2. TNK–Thinking about errors	3.55	0.77	-.206	.086	.310**	(.822)										
3. COM–Error communication	3.82	0.56	-.117	-.163	.262**	.396**	(.780)									
4. CPT–Error competence	3.80	0.79	-.120	-.099	.327**	.430**	.315**	(.710)								
5. LRN–Learning from errors	2.81	0.57	-.436	-.199	.545**	.488**	.324**	.331**	(.875)							
6. ANT–Error anticipation	3.60	0.72	.039	.655	.341**	.316**	.168**	.157**	.321**	(.597)						
7. STR–Error strain	2.60	0.71	.238	.195	-.060	.253**	.012	-.167**	.076	.424**	(.781)					
8. COV–Covering up errors	1.92	0.66	.587	.190	-.205**	-.146**	-.303**	-.166**	-.215**	.196**	.398**	(.797)				
9. ERR-S–Errors (slips/lapses)	2.51	0.68	.063	-.271	.004	-.044	-.157**	-.291**	-.011	.104*	.247**	.223**	(.730)			
10. ERR-M–Errors (mistakes)	2.19	0.77	.524	-.077	.073	-.016	-.165**	-.247**	.004	.205**	.199**	.235**	.570**	(.824)		
11. PWD–Power distance	2.86	0.81	.235	-.254	-.013	.029	-.214**	-.032	-.052	.118*	.207**	.217**	.231**	.209**	(.785)	
12. UAV–Uncert. avoidance	3.87	0.68	-.406	-.035	.073	.324**	.243**	.274**	.198**	.064	.064	-.132**	-.062	-.186**	.155**	(.821)
<i>Factor score determinacy</i>					.90	.92	.90	.88	.94	.86	.91	.90	.90	.91	.92	.91

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5 Note: **p< .01

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