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Effects of tidy/messy work environment on human accuracy

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Abstract

Purpose – The purpose of this paper is to study the relationship between accuracy and conscientiousness among people working in a tidy/messy work environment.

Design/methodology/approach – A laboratory experiment was conducted, where participants performing a simple task in a highly controlled environment were sorted into two different treatments, a tidy or a messy work environment.

Findings – The results of this study suggest that conscientious people commit more errors in a messy environment than in a tidy environment. Therefore, one of the most significant findings to emerge from this study is that a messy environment could be detrimental to the accuracy of conscientious people.

Research limitations/implications – This study is limited in several respects. First of all, the sample is not large, with 80 participants; some variables, such us IQ levels, fatigue levels, caffeine consumption, etc. were not controlled for. Third, the task was restricted to inputting data into a computer.

Practical implications – Taken together, these findings suggest the need to promote excellence in work environment tidiness, because highly conscientious employees will work with greater accuracy, while the less conscientious will not be affected. Therefore, overall, accuracy will be better. Consequently, the managers of the organization should be committed to defining policies about high standards of tidiness in the workplace environment.

Originality/value – This is the first study to provide evidence of the moderation of the tidy/messy work environment in the relationship between conscientiousness and human accuracy. The present study sheds light on the impact of messy work environment on accuracy of high conscientious people, inducing them to work in a defective way.

Keywords Quality, Performance, Personality, Work, Continuous improvement, Distraction

Paper type Research paper

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1. Introduction

There is considerable agreement that conscientiousness includes a basic dispositional sense of accuracy, with adjectival terms such as "reliable", "dependable", "dutiful", "cautious" and "responsible" used to capture this meaning (Barrick and Mount, 1991, 2000; Costa and McCrae, 1992; Mount and Barrick, 1995). On the other hand, to err is human. Managers cannot easily change the human condition, but they can change the conditions of the work environment so employees may work with more accuracy (Reason, 2000, 2008). From a scientific point-of-view we need to solve many questions relating to human error: Why do people make mistakes? What is the interaction between work environment and human accuracy? What are the most important personal traits and organizational features in explaining human accuracy?

This interaction between work environment and personal characteristics is a topic of interest to the person-organization (PO) fit, which is defined as the compatibility between an individual and his work environment. This fit is high when their characteristics are well matched (Kristof, 1996). Although seemingly far from conclusive, there is a considerable body of research on the conceptualization and empirical validation of PO fit. However, it appears that the extension of the research about the fit between personality and work environment toward more applied and practical fields has not been progressing. In particular, no empirical research has been conducted to determine what effects a tidy/messy work environment may have on the accuracy of both conscientious employees and those who are less conscientious. Accordingly, the present study focuses on the effect that a work environment that may be described as tidy or messy could produce in people that score high/low in terms of conscientiousness.

The present article aims to study if the relationship between the level of conscientiousness of the employees and their accuracy is influenced by the tidy/messy environment in which they operate. To study this, a laboratory experiment was conducted, where participants performing the same, simple task in a highly controlled environment are exogenously sorted into two different treatments, i.e. into a tidy environment and a messy environment. To the best of our knowledge, no previous study has provided empirical evidence on this topic. Therefore, the contribution of this article is the novelty of studying the relationships among the following three subjects: work environment based on order (tidiness), and the conscientiousness and accuracy of employees. The importance of the topic consists in understanding how tidiness/messiness in the work environment can change the performance accuracy response of people according to their level of conscientiousness. The results of the present study could help organizations, business and other, to understand the importance of tidiness in the work environment in order to increase accuracy and to reduce errors. In addition, a more refined understanding of the interaction between person-organization (PO) fit will be generated. Organizational policy about tidiness in the environment would not be detrimental to the performance of any person. For instance, if results suggest that messy environment has a negative impact on some people and does not affect others, then we would conclude that promoting a tidy environment will be a key policy for the organization and must be implemented so as to achieve excellence in quality.

The article is organized as follows. First, we provide a general literature review to lay the theoretical groundwork for explaining the fundamentals of the relationship

between conscientiousness, accuracy and tidy work environment. Second, we provide hypotheses about how a tidy/messy work environment may influence the relationship between the level of conscientiousness and employee accuracy. Third, we describe a laboratory experiment conducted to test these hypotheses. Fourth, the main empirical results are summarized. Finally, the implications of these results, main conclusions and suggestions for future research are discussed.

2. Theoretical foundations for conscientiousness, accuracy and tidy/messy work environment

2.1 Conscientiousness and human accuracy

The five-factor model (FFM) of personality is a hierarchical organization of personality traits in terms of five basic dimensions:

(1) extraversion;

(2) agreeableness;

(3) conscientiousness;

(4) neuroticism (also known as emotional stability); and

(5) openness to experience (McCrae and John, 1992).

In addition, a considerable amount of research indicates that Conscientiousness is one of the best predictors of performance in the workplace (e.g. Barrick and Mount, 1991; Barrick *et al.*, 2001; Hurtz and Donovan, 2000; Oh *et al.*, 2011; Ones *et al.* 2007; Ones *et al.*, 2005; Salgado, 1997, 2002).

With regard to stable individual differences, some personality characteristics may predispose individuals to being more susceptible to experiencing cognitive failures than others (Wallace *et al.*, 2002). Cognitive failure is defined by Martin as a "cognitively based error that occurs during the performance of a task that the person is normally successful in executing" (Martin, 1983). According to Wallace and Vodanovich, cognitive failure in a workplace is negatively related to Conscientiousness (Wallace and Vodanovich, 2003). Indeed, it is not hard to conceive that an employee makes more errors because he/she is careless, irresponsible, lazy, impulsive and low in achievement striving (low conscientiousness). Therefore, employees with high scores on conscientiousness should obtain higher accuracy at work. In general, conscientiousness is associated with error detection, because employees who are highly conscientious are more alert to discrepancies between expected and actual performance, i.e. they are more attentive to fulfilling standards and, therefore, make more effort to avoid committing many errors. Mount and Barrick (1995) found that conscientiousness is strongly correlated with quality ($\rho = 0.44$). "This makes sense because conscientious people plan and organize their work, and are careful, thorough, and detail oriented. Such individuals are more likely to spot problems and errors in processes and output" (Barrick and Mount, 2000, p. 19). This leads to fewer errors and enables highly conscientious employees to produce better quality work.

Most organizations have understood that a neat and clean work environment helps workers to perform their duties better. They make a significant financial and personal effort to clean and tidy up daily. For this reason, many of the scientific studies conducted about the relationship between conscientious people and quality have been carried out in a neat and clean work environment. So the relationship between conscientiousness and quality established in many studies is based on a work environment oriented to tidiness.

The question, therefore, concerns what would happen if highly conscientious people were to work in an environment that is not kept clean and tidy.

Therefore, conscientiousness is a key concept for human accuracy in most organizations where good housekeeping is standard.

Nevertheless, we would like to know more about the behavior of conscientious people in environments where there is no such match between personality and environment. How do they work when there is no proper fit between the order in their brain/personality and tidiness in the work environment? What are the factors underlying this fit or lack of fit? How valuable is this fit? This paper explores new data to account for the importance and value of this fit between tidiness in a work environment and worker personality.

2.2 Human accuracy and tidiness in work environment

Human accuracy is the ability of a person to perform correctly. Person-organization fit theory states that the behavior of the person is influenced by his/her interaction with his/her organization. This is included in the interactional psychology field. Interaction psychology explains the behavior of people in terms of the personality itself and the situations in which people act. According to this theory, personal behavior can be explained as a result of the interaction between the person and his/her situation. Kristof-Brown *et al.* (2005) indicate that concept of person-organization fit has been conceptualized in many ways, such as person-organization fit, person-job fit, person-group fit, person-supervisor fit and person-vocation fit. Person-Organization fit is defined by Kristof as "the compatibility between people and organizations that occurs when: a) at least one entity provides what the other needs, b) they share similar fundamental characteristics, or c) both" (Kristof, 1996). The fit may be supplementary or complementary. The former is related to the grade of compatibility between individual and organization. The latter is reached when one fill gaps in the other. In this case, there are two kinds of gaps; demands-abilities [D-A] fit or needs-supplies [N-S] fit (Cable and Edwards, 2004; Kristof, 1996; Muchinsky and Monohan, 1987). In the case of organization evaluation, researchers have established two ways: an objective assessment based on quantitative organization and personal variables, and a subjective one, based on the opinion of subjects. Objective fit is based on information that is gathered separately from the person and the organization (Cable and Parsons, 2001; O'Reilly *et al.*, 1991). In contrast, perceived fit relies on information collected from the person. (Cable and DeRue, 2002; Lauver and Kristof-Brown, 2001).

As we mentioned, conscientiousness is key for explaining human accuracy. Conscientiousness is a key trait of the personality dimension. This personality dimension is important for explaining individual performance. Order is one of the six facets of conscientiousness and, because of that, is very relevant for this trait. However, order in the personality dimension is different from order in the environment, namely tidiness. A worker may score high in terms of conscientiousness but work in a messy environment. In this case, the organization does not provide what the personality of workers would like. As there is an interaction between person and organization, this research tries to address whether a tidy/messy environment may affect personal behavior in terms of accuracy.

As has been pointed out before, the objective of our research is to determine if the relationship between the level of conscientiousness of employees and their accuracy is

influenced by the type of work environment in which they operate – that is, depending on whether this environment is tidy or messy. To the best of our knowledge, little work has been done to investigate this type of influence. Distraction is the change of attention of an individual from the chosen object (target) to the source of distraction (distracter). Frequent sources of external distraction are noise and visual stimuli. Any sudden change in work environment may disrupt the activity, generate distraction and affect work performance. Noise has been researched as a source of external distraction. Many researchers have studied and found the effects of noise on performance. Most have stated that intensity affects stress and impairs performance (Kjellberg, 1990; Kjellberg *et al.* 1996; Knez and Hygge, 2002; Knez and Niedenthal, 2008; Szalma and Hancock, 2011). Few studies have carried out as regards visual distraction (Kim and Hopfinger, 2010) or emotional distraction (Dolcos and McCarthy, 2006; Perfect *et al.*, 2012). Kim and Hopfinger studied the neural basis of distraction in the case of the abrupt appearance of new objects. The results of this research suggested that distraction reduces the capacity to code the location of the targets. If the distracter is perceived as a new object, the subject increases the processing of distracters in the brain and reduces target processing (Kim and Hopfinger, 2010). The research done by Dolcos and McCarthy reported the first direct evidence that the detrimental effect of emotional distracters on working memory maintenance is associated with cognitive-affective interactions. The mechanism is associated with the interaction between activity in the brain regions responsible for active maintenance of goal-relevant information in working memory and for emotional processing. These activities take place in different parts of the brain but interact with one another. These results shed light on the neural mechanisms underlying the impairing effect of emotional distraction (Dolcos and McCarthy, 2006). Perfect *et al.* analyzed the quality and quantity of answers in the presence of irrelevant visual distraction. Forty eight participants watched a video clip and then answered questions about the video in several conditions of distraction. More distraction led to more incorrect answers. This research concluded that the impact of environmental distraction on memory quality and participant accuracy is significant. Therefore, distraction is one field that may help us to interpret what is happening in the brain of participants so as to understand their behavior (Perfect *et al.*, 2012).

There is some research which has found how tidy and messy environments influence people depending on their tidiness preference. Specifically, in an experiment conducted by Radomsky and Rachman (2004), participants differentiated between photographs of tidy and messy scenes by how comfortable they would feel in that scene. The results support the suggestion that there is a general preference for tidiness over messiness. Participants indicated that they would feel more comfortable or relaxed in tidy environments than they would in messy environments. According to these authors, this preference is adaptive, and it is not surprising to find an association between messiness and discomfort. Moreover, the degree of this preference was strongly correlated with participant scores on a psychometric scale of ordering and arranging behavior, indicating that increases in ordering and arranging beliefs and behavior were associated with increases in the degree to which participants preferred the photographs of tidy scenes over messy scenes.

In addition, the research study mentioned above (i.e. Radomsky and Rachman, 2004) conducted another experiment in which participants were divided into two groups

depending on their scores for ordering and arranging behavior. All participants were instructed to prepare a five-minute speech on any topic that would be graded on content and style by faculty. To prepare their speech, participants were randomly assigned to either a tidy room or a messy one. This research found that participants with a strong preference for tidiness who had prepared their speech in a messy environment were significantly more anxious than those in a tidy environment, and participants with a low preference for tidiness did not differ in anxiety levels in different environments. It is true that the conscientiousness assessment criteria were different to those used by Radomsky and Rachman (2004) to measure ordering and arranging behavior. However, it would also not be surprising to find that people who spend a great deal of time ordering and arranging their surroundings (e.g. people with high conscientiousness) experience some anxiety or, at least, more distraction and uncomfortable feelings when they are surrounded by a messy environment.

Furthermore, the suggestion about discomfort and more sources of distracters for conscientious individuals in a messy environment is a reasonable position because of the lack of fit between person (conscientiousness) and organization (messiness) in the physical environment they occupy. Specifically, Gosling *et al.* (2002) studied links between individuals and the physical environments they occupied and levels of conscientiousness. For both offices and bedrooms, occupant self-ratings of conscientiousness were strongly correlated to tidiness cues in the environment (clean, organized, neat, and uncluttered) where they were. Therefore, individuals organize their physical environments to reflect and reinforce who they are in terms of the conscientiousness personality trait (Gosling *et al.* 2002). Based on the most recent research, we hypothesize that a messy environment could have a negative impact on the accuracy of conscientious people because of the lack of fit between person and organization in the work environment. Moreover, to the best of our knowledge, as regards individuals with low conscientiousness, little work has been done to investigate if there are differences in their accuracy between working in a tidy or a messy environment. On one hand, we know that they may have a certain preference for messiness, although not so much as people who score high on orderly behavior. On the other hand, we know that the physical environment they occupy (office or bedroom) is related to messiness cues (Gosling *et al.* 2002); and they do not experience any anxiety when they are in a messy environment (Radomsky and Rachman, 2004). Therefore, there is no study or evidence to ground a hypothesis that a tidy environment has some influence on the accuracy of people with low conscientiousness.

Therefore, human behavior could be affected by a lack of fit between organization tidiness and highly conscientious person.

Therefore, conscientiousness is a key concept for human accuracy. A tidy or messy work environment may affect human behavior. Therefore, a tidy or messy work environment may affect human accuracy.

2.3 Hypothesis

Therefore, we hypothesize that, in a tidy organization, people with high conscientiousness perform better in terms of accuracy because of a fit between their personality trait and organization tidiness. There is a match between person and organization. We propose the following hypothesis:

H1. In a tidy work-environment employees with high conscientiousness make fewer errors than employees with high conscientiousness in a messy work-environment.

In addition, we hypothesize that, in a tidy or messy organization, people with low conscientiousness behave similarly in terms of accuracy because the lack of fit between their personality trait and organization tidiness does not affect their behavior.

H2. In a messy work-environment employees with low conscientiousness make similar errors to employees with low conscientiousness in a tidy work-environment.

Based on the above hypotheses, Figure 1 depicts the comparison of the average relative errors of the groups, according to their level of conscientiousness (high or low) and work environment (tidy or messy).

3. Research methodology

3.1 Study design

A laboratory experiment was conducted to test these hypotheses, where participants performing a simple task in a highly controlled environment are exogenously sorted into two different treatments. The experiment manipulated one independent variable: things in the work environment were out of place but, at the same time, with no effect on the work itself, i.e. the workplace was messy but people were able to do their work in the same conditions as in a tidy work environment. There are two levels or treatments:

(1) A messy work environment, i.e. an environment with many papers and other objects scattered across the desk and workplace, where it is evident that these objects were not in their proper places.

(2) A tidy work environment, i.e. an environment where nothing is out of place.

The focal dependent variable is the accuracy level of the individual. Accuracy is measured by computing the relative error of the individual, i.e. the number of incorrect answers divided by number of total answers. The experiments took place on the same

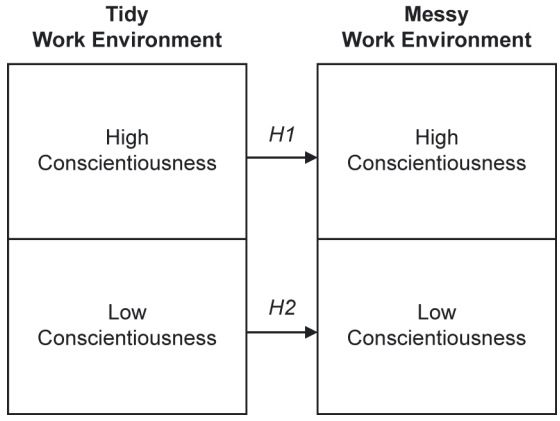

Figure 1.
Relative errors hypotheses: *H1-H2* in a tidy/messy work environment

day of the week (Friday) and during the same time period (from 16:00 to 18:20) but in different weeks.

3.2 Participants

All of our participants are university students recruited from different Schools of the University. The final dataset comprises 80 students, of whom 31 are male and 49 are female. Their median age is 20 years. In the announcement, it was stated that the job is a one-off two-hour job paying €14 (EUR 1 ≈ USD 1.35). Moreover, the announcement also explained that the job is part of an academic research project and that they would fill out a questionnaire for a personality test.

Each participant was assigned randomly to one of the two treatments and informed about the precise date and location to carry out the job. A total of 39 participants were in the messy work environment treatment and 41 in the tidy work environment treatment. Both treatments were performed in a computer lab at the University.

3.3 Procedure and task

A simple work task requiring no previous knowledge was chosen. In this task, students transcribed the results of a survey from paper to computer.

Before the experiment, we filled out the survey we had designed in the online program, in order to create the responses of 80 supposedly different individuals. Each survey contained 44 answers (inputs) to transcribe (to enter) into the online program. The survey data, type and model of computer, identification numbers and order of the surveys were the same for all participants.

They worked for one hour on the transcription of the surveys. Afterwards, they filled in the NEO PI-R personality test, and finally they filled in a brief questionnaire about their impressions of the physical work environment in which they worked. Payment was independent of output and was paid by electronic transfer. The procedure was exactly the same for both treatments.

In the messy treatment, participants were in a work environment with many unnecessary papers and documents on the desks; pencils, clips, staples scattered on the desks and floor; many papers and some empty boxes scattered on the floor. It is important to clarify that the location of these things did not interfere with the operating capacity of the participants, i.e. they had sufficient free space on the desk to deal with the surveys. In contrast, in the tidy work environment treatment, there were no untidy or unnecessary things, either on the desks or the floor. Thus, only the survey forms and the computer were on the desks of the participants.

3.4 Measures

- *Individual accuracy*. Accuracy is measured by computing the relative error of the individual, i.e. the number of incorrect inputs divided by the number of total inputs. Each survey answer that the participant clicked on was counted as an input. The identification number of each survey that he/she had to transcribe was also counted as an input. An input was considered to be correct when the participant entered an answer that corresponded to the respective survey received at the beginning of the work task. If a participant omitted or repeated a survey, this was counted as 44 incorrect inputs, i.e. the total number of inputs of the survey. The online program has a tool that collects, in an Excel spreadsheet, all the

answers (inputs) filled in by the participants. This allows us to compare the answers entered by the participants with the answers filled out previously by us.

- *Conscientiousness.* The Revised NEO Personality Inventory (NEO PI-R) (Costa and McCrae, 1992) was used to measure conscientiousness, extraversion, agreeableness, neuroticism and openness to experience for each participant, which is a 240 item set of self-statements that assess the five dimensions of personality along with six facet scales for each factor. Items are answered on a five-point Likert scale ranging from strongly disagree (0) to strongly agree (4). Scales are roughly balanced to control for the effects of acquiescence. Data on the accuracy and validity of the instrument is summarized in the *Manual* (Costa and McCrae, 1992). The reliability of the conscientiousness factor is 0.9 (Costa and McCrae, 1992). Forty-eight statements relating to conscientious are included in the NEO-PI-R. All items are a single coherent factor denominated conscientiousness.
- *Work environment.* A short anonymous questionnaire was used to ask participants about how they perceived the physical environment of work: tidy/messy and other physical conditions. The aim of this questionnaire was to confirm if the participants perceived the environment according to the type of treatment that they had been assigned.

Clustering with respect to conscientiousness. In order to study the hypotheses stated above, two clusters of high and low conscientiousness individuals were formed for each treatment (tidiness and messiness) separately. This clustering procedure yielded the following four groups (G) of individuals from the sample:

- high conscientiousness (h) individuals in the tidiness treatment (t).
- low conscientiousness (l) individuals in the tidiness treatment (t).
- high conscientiousness (h) individuals in the messiness treatment (m).
- low conscientiousness (l) individuals in the messiness treatment (m).

Each treatment is clustered separately instead of clustering the pooled sample for both treatments because the fact of tidiness or messiness may affect the measurement quality of the conscientiousness variable, and clustering the two treatments separately may control for this problem and, therefore, provide more robust results. Under this clustering method, the level of high and low conscientiousness is relative to the sample, i.e. conscientiousness levels do not coincide, necessarily, with the absolute levels that are indicated in the NEO PI-R manual (Costa and McCrae, 1992). The clusters of conscientiousness were created using the Ward's linkage clustering procedure (Ward, 1963), and the Euclidean distance measure was used in the clustering procedure. In addition to cluster classification, individuals with high and low conscientiousness were identified in the sample using the absolute levels indicated in the NEO PI-R manual (Costa and McCrae, 1992) for confirming both alternatives.

Comparison of cluster means. After forming two groups for each treatment, the two hypotheses stated previously were tested by comparing the mean relative errors of each set of the two groups mentioned in the hypothesis. First, the following notation was introduced for the mean relative error of individuals in each group (G1-G4) defined in the previous subsection:

- Let μ_{ht} denote the mean relative error of high conscientiousness individuals in the tidiness treatment.
- Let μ_{lt} denote the mean relative error of low conscientiousness individuals in the tidiness treatment.
- Let μ_{hm} denote the mean relative error of high conscientiousness individuals in the messiness treatment.
- Let μ_{lm} denote the mean relative error of low conscientiousness individuals in the messiness treatment.

Using this notation, the two hypotheses presented above may be reformulated as follows:

H1. The mean relative error of high conscientiousness individuals in a messy work environment μ_{hm} is greater than the mean relative error of high conscientiousness individuals in a tidy work environment μ_{ht}, i.e. $\mu_{hm} > \mu_{ht}$.

H2. The mean relative error of low conscientiousness individuals in a messy work environment μ_{lm} is the same as the mean relative error of low conscientiousness individuals in a tidy work environment μ_{lt}, i.e. $\mu_{lm}=\mu_{lt}$.

The hypotheses were verified by the two-sample mean difference tests (T-test).

4. Results

Table I summarizes some descriptive statistics of conscientiousness and relative error variables for the pooled sample of individuals and for various subgroups of the full sample. The pooled sample is divided by two binary variables: the type of treatment (tidiness and messiness) and the cluster of level of conscientiousness (high or low). Table I provides information about the distribution of individuals in the different groups, reporting the number of individuals for each group. Moreover, Figure 2 presents the dispersion graph by treatment and cluster.

Table II summarizes the results of the two-sample mean comparison tests. These tests evaluate the hypotheses of this article. First, the mean comparison test accepts *H1* hypothesis ($p < 0.01$), i.e. $\mu_{hm} > \mu_{ht}$. Thus, when high conscientiousness individuals

Conscientiousness		Messy WE	Tidy WE	Total	Relative error		Messy WE	Tidy WE	Total
LC	Count	21	34	55	LC	Count	21	34	55
	Mean	34.00	39.21	37.22		Mean (%)	1.43	1.56	1.51
	SD	3.63	6.53	6.12		SD (%)	1.72	2.62	2.30
HC	Count	18	7	25	HC	Count	18	7	25
	Mean	46.61	59.43	50.20		Mean (%)	3.92	0.68	3.02
	SD	3.90	5.03	7.18		SD (%)	4.48	0.63	4.07
Total	Count	39	41	80	Total	Count	39	41	80
	Mean	39.82	42.66	41.28		Mean (%)	2.58	1.41	1.98
	SD	7.37	9.91	8.83		SD (%)	3.48	2.42	3.02

Table I.
Descriptive statistics of data

Note: The SD denotes standard deviation. The Messy WE and Tidy WE refer to messy work environment and tidy work environment, respectively

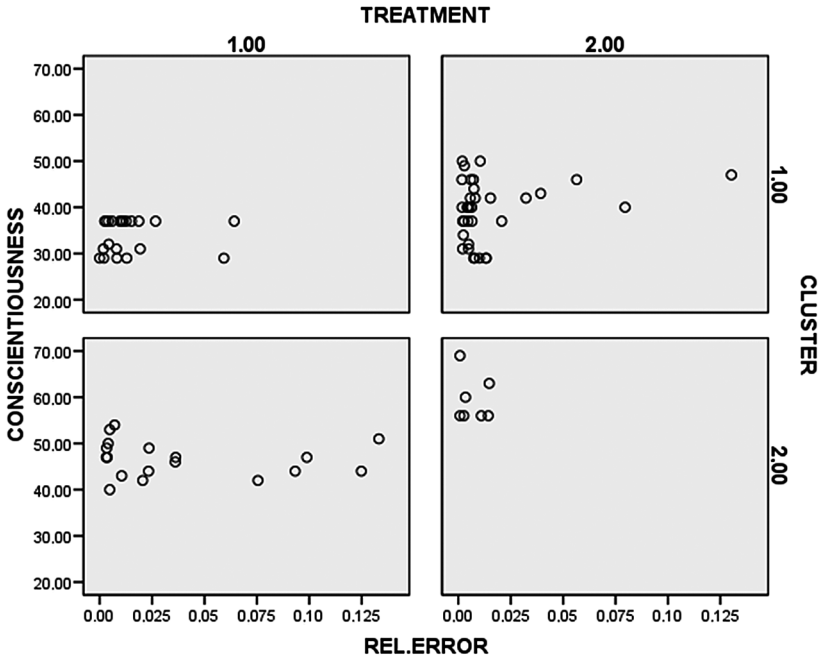

Figure 2.
Conscientiousness-relative errors: dispersion graph treatment and cluster

are considered, the level of relative errors they have committed is higher in the messy treatment than in the tidy treatment. Second, the mean comparison tests cannot reject *H2* hypothesis ($\mu_{lm} = \mu_{lt}$). Thus, we find that tidy and messy environments do not have an influence on the relationship between low conscientiousness individuals and their accuracy.

The results of the work environment questionnaire confirm that most participants perceived the environment according to the type of treatment that they were assigned. In particular, all participants in the messy treatment answered that the room was messy and 84 percent participants in the tidy treatment answered that the room was tidy.

5. Discussion and conclusions

5.1 Discussion

There are many studies that suggest that conscientious people tend to have a better performance at work and, therefore, better accuracy. Nevertheless, the results of this study suggest that a physically messy environment can reduce the degree of worker accuracy. Thus, the accuracy of these individuals is lower when they are compared with conscientious individuals in a tidy work environment. This variability in the accuracy of conscientious participants is consistent with the person-organization fit approach, which claims that mismatch between personal characteristics and organizational context can have deleterious effects on performance and attitudes (Kristof-Brown *et al.*, 2005).

One way to explain this negative influence of the messy environment on conscientious people could be that they prefer the appearance of tidiness, i.e. they have a tendency to keep their environment tidy and well organized, and being in a messy environment,

Table II.
Two-sample mean comparison test results

Notation	Work environment	Level of conscientiousness	Mean	Mean differences	t	df	Sig. (two-tailed)
μ_{lt}	Tidy	Low	0.0156				
μ_{ht}	Tidy	High	0.0068				
		Equal variances not assumed		0.00877	1.725	37.775	0.093*
μ_{lm}	Messy	High	0.0392				
μ_{ht}	Tidy	High	0.0068				
		Equal variances not assumed		0.03246	2.998	18.632	0.008***
μ_{lm}	Messy	Low	0.0143				
μ_{hm}	Messy	High	0.0392				
		Equal variances not assumed		−0.02497	−2.228	21.259	0.037**
μ_{lm}	Messy	Low	0.0143				
μ_{lt}	Tidy	Low	0.0156				
		Equal variances not assumed		−0.00129	−0.220	52.763	0.827

Note: * $p < 0.010$; ** $p < 0.05$; *** $p < 0.01$

conceivably, makes them feel uncomfortable. The present findings seem to be consistent with Radomsky and Rachman (2004), who suggest that people with a strong preference for tidiness are more likely to be disturbed (e.g. feel anxious) when they work in a messy environment. Some researchers in the field of distraction have stated that worker performance may be altered as a consequence of distraction, both internal and external. Stimuli such as noise, light, movement, object, emotions and perceptions can affect people (Dolcos and McCarthy, 2006; Kim and Hopfinger, 2010; Kjellberg *et al.* 1996; Knez and Hygge, 2002; Knez and Niedenthal, 2008; Perfect *et al.*, 2012; Szalma and Hancock, 2011). Brain specialization allows it to operate and feel as a whole. Nevertheless, although brain function is divided into two hemispheres, both are connected and one affects the other. When a person is processing information and preparing for action, any distraction can slow down this process and provoke mistakes. If the person cannot complete the preparation phase then the execution may be carried out with mistakes, i.e. without accuracy. Because of that, a tidy/messy environment may be really important for accuracy. Distraction could come from the interaction of personality and work environment, mainly when the work environment is the source of distracters.

On the other hand, when high conscientiousness people are in a tidy environment they fulfill the predictions of greater accuracy. This result indicates that tidiness in a work environment could lead individuals with high conscientiousness to feel more comfortable and behave with the level of accuracy that characterizes their personality trait.

In contrast, people with low conscientiousness make a similar level of mistakes in a messy work environment as in a tidy work environment. This lack of influence from the tidy/messy environment may be due to the fact that their discomfort in a tidy environment is not so strong. Perhaps tidiness is the expected situation for low and high conscientiousness people and they are aware of this. There is no distraction from the external environment and the brain is focused only on the target activity. The lack of influence from a messy environment on people with low conscientiousness is a reasonable result if we take into account the earlier observations, which showed that low scores on the conscientiousness scale correlate with people who are described as dirty, messy, untidy, disorganized, slovenly, and sloppy (Costa and McCrae, 1998); and, therefore, their personality dimension of conscientiousness matches well with a disorganized and messy environment.

5.2 Implications for practice

It can, therefore, be assumed that messiness may influence the accuracy of conscientious people and prevent them from doing their best. Their increase in task errors may be explained by the fact that conscientious people are intolerant of messiness, which leads them to feel uncomfortable. Their discomfort in this kind of environment could influence their accuracy, inducing them to work in a less effective way or to make more errors. This poses a significant challenge in the production process since it would involve a greater waste in consumed resources. This fact is even more significant in the case of work environments where professionals are working with people's lives, such as in operating rooms, pharmaceutical laboratories, air traffic control towers, nuclear power plants, etc. It is important that the physical working

environment in these places be tidy so as to avoid errors, defects, mistakes or accidents that could have fatal consequences.

People are fallible; even the best make mistakes. It is human nature to err. Because of such fallibility or innate tendency towards imprecision, human beings are vulnerable to many external and latent conditions that cause them to be unreliable. Vulnerability to such conditions makes people susceptible to error and, therefore, countermeasures are needed. "Countermeasures are based on the assumption that although we cannot change the human condition, we can change the conditions under which humans work" (Reason, 2000, pp. 393-4). To have high conscientiousness is, of course, essential for accuracy and effective performance but it is not enough. The results of this research suggest that the relationship between conscientious employees and their accuracy are moderated by the tidy/messy environment in which they operate. A tidy environment fits better with the preferences of conscientious people and, therefore, with their disposition to perform better. A messy environment matches poorly with conscientious employees because this condition can affect their feeling of comfort. This mismatch can cause a variety of errors that result in deviations from the organization's expectations. This finding suggests that a messy environment could influence the accuracy of the employees with high conscientiousness, inducing them to work in a less effective way. It may be regarded as a latent condition. Consequently, the management of the organization should be committed to defining policies about high standards of tidiness in a workplace. Thus, conscientious employees need to fit their personality with the environment and, as a result, will be able to perform with the accuracy expected. It can, therefore, be assumed that a tidy environment is not detrimental to accuracy for anyone. By contrast, a messy environment would be detrimental to the accuracy of conscientious people but not to the accuracy of people with low conscientiousness.

5.3 Limitations and research needs

This study is limited in several respects. First of all, the sample is not large, with 80 participants; some relevant variables as IQ levels, fatigue levels, proximal caffeine consumption, smoking/drug use, participant levels of obsessive compulsiveness, etc., were not controlled for, and may have a strong influence on experimental performance and on whether participants perceive a messy environment as distracting or not. Second, the task was restricted to inputting data into a computer. There are several kinds of tasks where the response of workers to the tidy/messy work environment could be different. It is necessary to develop new experiments with other tasks. Third, although the findings of the current study are consistent with those of Radomsky and Rachman (2004), who found that people with a strong preference for tidiness feel more comfortable/relaxed if they work in a tidy environment than in a messy environment, the current research was not specifically designed to evaluate uncomfortable feelings related to a messy environment; also the conscientiousness assessment criteria are different to those used by Radomsky and Rachman for assessing ordering and arranging behaviors. Nevertheless, this is the first attempt to study the importance of a tidy work environment in terms of its influence on the relationship between conscientiousness and human accuracy, and may contribute to reducing wastage and errors in many types of businesses. Further investigation and experimentation into the moderating influence of a tidy/messy environment on the relationship between

conscientiousness and accuracy could provide more definitive evidence and contribute further to the Person-Organization fit theory.

5.4 Conclusions

The purpose of the current study was to examine the interactional effects of a tidy/messy work environment and conscientiousness on human accuracy. One of the most significant findings to emerge from this study is that the right fit between person and organization in tidiness will reduce errors and improve accuracy in employees with high conscientiousness, without being detrimental to people with low conscientiousness. The results of this study suggest that people with high conscientiousness commit more errors in a messy environment than in a tidy environment. Therefore, a messy environment is detrimental to the accuracy of conscientious people. A possible explanation for this might be that conscientious people and a tidy work environment fit well, i.e. they have a tendency to keep their environment tidy and well organized, and being in a messy environment conceivably makes them feel uncomfortable and provoke distraction. More generally, our research shows how beneficial it can be for the organizations if they promote policies about housekeeping in the workplace. This tidy environment is beneficial for all, the highly conscientious will work with accuracy, and the less conscientious will remain unchanged. Otherwise, the lack of decisions or omissions as regards tidiness policies in the workplace, by the management of the organization, may be regarded as a latent condition for error which has a greater impact on conscientious employees. In closing, given the important role of conscientiousness as one of the predictors of job performance, we hope that our article will stimulate further research about the importance of person-organization fit in increasing human accuracy and excellence in organizations.

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