

Laboratory of Psychology and Cognitive Sciences

University of Genoa (Italy)

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Free distortion task as a new paradigm for exploring implicit processes:
the case of COVID-19 pandemic.

Alberto Greco

Abstract

Linguistic research has shown that in a free sentence distortion task there is a strong tendency to retain syntagmatic structures. We hypothesized that this tendency may be influenced by affective factors and that sentences containing words that evoke emotions, feelings or attitudes may be distorted to varying degrees. We investigated whether this method could implicitly reveal the feelings that people experienced during the COVID-19 pandemic. The time taken to distort sentences containing target words was found to be correlated with the intensity with which anxiousness, depression, health-related concerns, and feelings of isolation were experienced, as detected by an explicit questionnaire. When asked to further distort the already distorted sentences, the sentences produced by subjects who had perceived more anxiousness, depression and isolation were more distorted. Implications about the more general use of this method to reveal implicit processes are discussed.

1. Introduction

1.1. The Free Distortion Task

The Free Distortion Task (FDT) is a paradigm created by Albertini, Tettamanti, and Moro (2012, 2015), aimed to understand whether participants, after reading short sentences, were able to create word order distortions and whether or not this disorder was systematic, i.e., not created in random order, but supported by some strategy that reduced the use of cognitive resources.

The results of their experiment show a twofold conclusion: on the one hand, it was understood how participants, despite being asked to distort sentences in a completely random way, tended to produce word combinations in a systematic way. On the other hand, it seems that the subjects, in the task of recalling words in a random way, tended to rely on morpho-syntactic and semantic-lexical factors, preferring some syntactic structures, as in the case of sentences composed of Subject-Verb-Object, which were easier to recall and unordered, without making mistakes (Albertini, Tettamanti, Moro, 2015).

In the original intentions of the creators of FDT, this method was applied to the study of working memory. The subjects were asked to read a sentence and memorize it, then they were asked to repeat the same words, but arranging them in a different order. This should have made it possible to

investigate the participants' linguistic representations by analyzing the anomalous structures they produced during sentence distortion. Although driven to recombine words at random, subjects consistently produced sentences conforming to regular patterns. The syntactic constituents were generally preserved by keeping the words belonging to the same syntagm in adjacent positions. The authors also used nonsense words, which led them to conclude that these patterns were not related to the lexical-semantic sentence content, such as semantic consistency or frequency of co-occurrence between words, but mainly just to morpho-syntactic factors. Their conclusion was that people cannot get rid of accessing the implicit syntactic structure of sentences.

It is interesting to note that grasping the global coherence of a text (Kintsch, 1998) is difficult for subjects with clinical disorders (autism, schizophrenia) while the local coherence is less difficult (Jolliffe and Baron-Cohen, 2000). Therefore, if the natural search for global coherence is compromised, it is possible that the most emotionally salient elements prevail at the local level.

A similar but opposite test to the FDT is the Scrambled Sentences Test (SST), which consists of offering participants distorted sentences and asking them to construct, from those, sensible sentences. There is a fairly large literature using this test that has found relationships with affective or personality-related variables. For example, it has been found (Rude et al., 2010) that a test requiring to rearrange distorted sentences can be used as a predictor of depression. According to a meta-analysis (Wurtz et al., 2022) the SST predicts both anxiety and depression. However, it does not appear that an attempt has been made to explore whether there are these affective relationships with the opposite test, FDT, to see how affective variables influence sentence distortion.

Elaborating upon this paradigm, our hypothesis was that the process of scrambling sentences, while certainly related to syntactic factors as highlighted by the authors, can also be impacted by affective factors. If a sentence contains critical words, i.e., words that may have meaning that evokes emotions, feelings, attitudes that relate to issues relevant to the subject, then the tendency to maintain a syntactic structure may be competing with the prominence of such critical words. It should therefore be possible to ascertain whether sentences expressing critical meanings have a different degree of distortion, i.e. are more or less subject to syntactic constraints, related to the cognitive load of rational processing. In addition, it is possible to consider the prominence of critical words, by considering the order in which such words are placed in the distorted sentence and the associated processing times.

1.2. Explicit and implicit feelings about COVID-19 pandemic

The construct we chose to investigate using the FDT method concerns the feelings that people experienced during the COVID-19 pandemic. As of January 2020, all countries around the world faced an unprecedented health emergency caused by the well-known COVID-19. This disease, because of its easy transmission from person to person, has begun to spread like wildfire to all continents of the world. Immediately, the need emerged to implement preventive measures that would minimize the risk of transmission, and the very high number of daily infections and deaths necessitated the implementation of strong containment, such as the closure of all commercial activities (except for basic necessities), obligation to remain in one's home except for reasons of work or health needs, only one family member could go out to procure supplies, any kind of meeting was prohibited, even with relatives. Understandably, these dynamics may have affected people's lives, who necessarily had to change habits, behaviors and lifestyles for extended periods of time. Quarantine, although it was evidently an effective method of virus containment, because of its long duration and the uncertainty of its termination was a complicated experience for most people, especially because of the loss of individual freedom and the state of uncertainty about their health and future.

The negative effects and consequences that a prolonged period of segregation can cause on people have already emerged from studies conducted in the past, in Canada, during the quarantine following the following the SARS respiratory disease, between 2002 and 2004. In these studies emerged how psychological effects can vary according to the length of the period of isolation: longer duration corresponded with greater feelings of anger, avoidance behaviors and symptoms of posttraumatic disorder stress (Hawryluck L., et al. 2004). It should be kept in mind that most people during the period of the of general lockdown were unable to perform their work activities, and this, combined with the change in their daily routine and the zeroing of social contact, was the cause of the onset of negative feelings such as demoralization, feelings of loneliness and isolation,, feelings that seem to persist up to six months after the end of the quarantine period (Jeong H., Yim H.W., Song Y.J, et al. 2016).

In a recent study conducted in the city of Wuhan, China, the place of origin of the Coronavirus epidemic, it was shown how the quarantine caused by the pandemic negatively affected mental health (Tang et al., 2020). The results showed that levels of anxiousness and depression are significantly higher in individuals who underwent quarantine, especially in areas that were not particularly at risk. With the spread of Covid-19, it is also possible that the number of people who have experienced hypochondriac symptoms has increased, due to the symptoms produced by the virus (fever, cough, difficulty breathing), which can cause severe discomfort and anxiousness because they can generate the belief that one has contracted the disease even before medical assessment.

The idea of our study started from a simple question: did the Covid-19-related pandemic have a greater or lesser conscious impact on people's mental health in terms of symptoms of depression, anxiousness, hypochondria, and isolation? According to our hypothesis, at the implicit level (and thus not directly explainable in words), the impacts on people may have been greater than what is communicable or perceptible at the explicit (consciously) level. Thus, the question we wanted to answer is: has the pandemic had more consequences on people's mental health than they believe? For example, does the level of depression that people express answering specific questions about that construct correspond to the level of depression that they actually felt?

To investigate this issue, we implemented a tool similar in structure to the FDT, which would allow us to explore implicit processes, with the the intent of measuring the implicit impact that certain critical words, related to the source constructs (depressiveness, anxiousness, hypochondria, isolation), had within the sentences in which they were embedded. At the end of the experiment, participants were given an explicit questionnaire that directly measured perceived levels of depressiveness, anxiousness, hypochondria (intended as health concern), and isolation during the pandemic, so that we could compare the implicit scores with the explicit ones, and be able to make final considerations for, or against, our starting hypothesis.

2. Method

2.1 Participants

42 students (21 male, mean age 23.79 years, sd 6.82), enrolled in introductory psychology courses at the University of Genoa, took part in this experiment for course credit. Informed consent was obtained prior to participation.

2.2. Stimuli

The first step in implementing the experiment was to choose the critical words for each construct, that is, those words that had particular salience and represented the concept strongly. The constructs considered were anxiousness, hypochondria, depressiveness, and isolation.

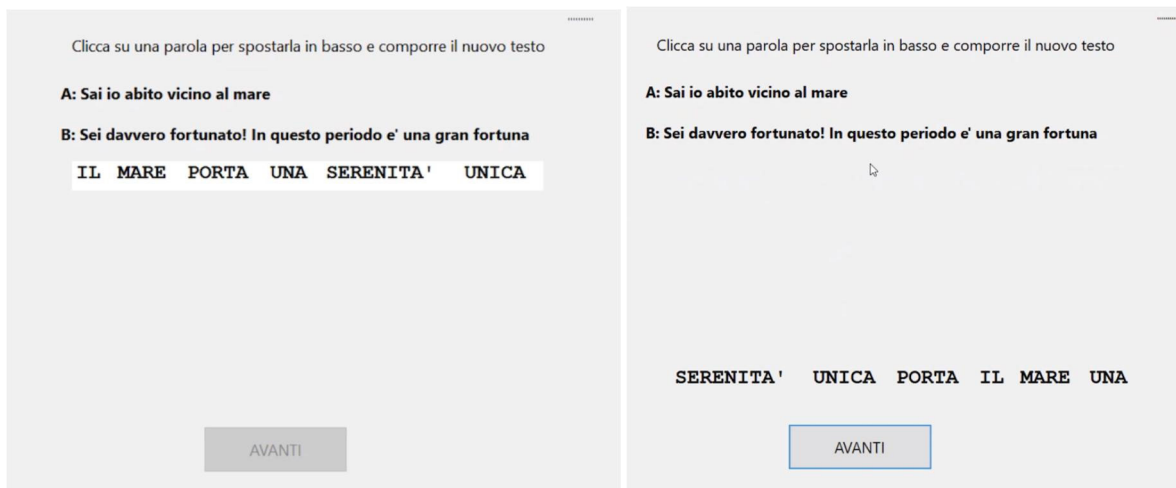


Figure 1. Example of a sentence to be distorted from the experiment. The text in the first line says: “Click on a word to move it down and compose the new text”. Following lines: A: You know I live near the sea, B: You are really lucky! At this time it is very good luck, THE SEA BRINGS A UNIQUE SERENITY. In this case, the critical word is SERENITA' (serenity) put in first position by the subject (right picture).

In the following list we label as DIR the valence that is directly representative of the construct (e.g., for anxiousness: distress or panic), and we label as REV (reversed) those that represent the opposite (e.g., serenity or calm). By convenience, we will use different terms to indicate the general feeling, representative of both the presence and absence of feeling, and the valenced feelings. Thus, we will indicate as “anxiousness” the general anxious feeling, but we will consider as *anxiety*-related those sentences or words related to actual anxiety states, and “depressiveness” will indicate the general depression feeling.

24 sentences were presented for distortion, each consisting of 6 words (see Appendix). For each construct there were six sentences, three directly representative of valence (DIR), and three representative of the reversed (REV) valence.

Anxiousness: DIR distress, panic, helplessness; REV serenity, calm, stability;

Depressiveness: DIR apathy, melancholy, despair; REV happiness, comfort, optimism;

Hypochondria: DIR death, pathology, infections; REV health, symptoms, breathing;

Isolation: DIR isolation, loneliness, individualism; REV sociality, interactions, involvement.

All the words chosen refer closely to the relative construct. The DIR words represent the typical symptoms or themes of the constructs as they typically manifest themselves (e.g., the pursuit of loneliness in a person particularly sensitive to isolation, or the fear of pathology as a fixation for a hypochondriac person). REV ones have the opposite meaning to the concept they represent. For example, the word “serenity” in the category of anxiousness represents the opposite of anxious symptoms, and its corresponding concept would be “distress”, as well as the word “optimism” in the category of depression represents the opposite of the view related to helplessness, typical of depression.

It may be plausible to consider valence as critical. This is because a person particularly sensitive to one or more of these constructs, would also be sensitive to the opposite aspects related to it. It has been shown that emotions have often both negative and positive valence (An et al., 2017; An et al., 2018; Vaccaro et al., 2020). For example, an anxious subject generally experiences his or her excessive apprehension with discomfort, aware that it is disabling and troublesome in daily life, and therefore might be sensitive to words such as distress or panic, because these are the ones that result in typical anxious reactions, but also to words such as serenity or calmness, which represent conditions that an anxious subject wishes to achieve, and consequently might be equally critical in our experiment.

In addition to the 24 sentences that contained the critical words, 6 other neutral sentences, which did not contain any salient words and did not represent any specific constructs, were presented to compare participants' attitudes and behaviors in distorting these sentences, compared with those containing the critical words. The complete list of 30 sentences is in Appendix 1. The order of presentation was randomized differently for each subject.

To make the experiment less cumbersome but as natural as possible, we decided to place all the sentences within a small dialogue between two unspecified individuals (A and B), with the aim of introducing a third sentence to be distorted, which could either contain a critical word of the chosen constructs or be neutral. Participants were initially asked to decompose the third sentence by a simple process: clicking with the mouse cursor on each word, it would descend further down the screen and, starting from the left, a new meaningless sentence was formed, composed of all the words clicked by the participant (Figure 1).

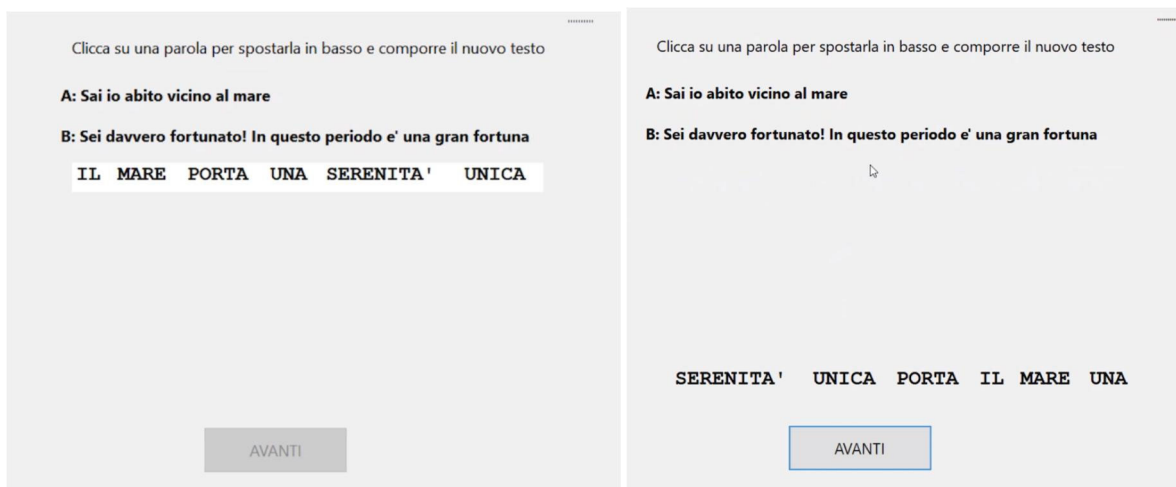


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2.3 Procedure

Instructions, stimuli, and response recordings were collected remotely by a custom computer program* executed on the same subject's PC, also in order to minimize any delays in recording response times due to remote communication. The performance of the experiment was monitored by the experimenter while sharing the subject's screen in a video call.

The experiment began with a warmup phase in order to make sure participants understood the task well. The instructions explained that the subjects would see a series of sentences and that for each one their task would be to arrange the words in a different order so as to construct a new text. It was made clear that they could choose the words in the order they preferred and that it was not important that a meaningful sentence result from this arrangement. They were asked to click the mouse quickly on each word without thinking. Six sentences, each consisting of 6 words, were presented in the warmup. If the subject waited more than 15 seconds in completing the rearrangement of the sentence, a message saying "you should be faster" was shown. During this phase, if the subject showed that he/she was always trying to construct sentences that made sense, the experimenter would verbally remind him or her that there was no need for the sentence to make sense.

*The program is available free of charge to interested researchers upon request.

We then moved on to the main task (which we will refer to from now on as Main 1), in which two sentences of a fictitious dialogue between a person A and a person B were first presented (in small letters). This dialogue was introduced to provide context to the sentence to be distorted and thus make the task more natural. After 5 seconds, the sentence to be distorted was presented, which, as mentioned above, consisted of 6 words and was in capital letters. Participants, again, were free to scramble the sentences in the way they preferred, with the only care being to respond as quickly as possible.

Once the distortion of all sentences was finished, the disordered sentences would appear on the screen, one at a time, and participants were asked to scramble them again so as to produce a second distortion. In the following we will refer to this task as Main 2. The idea of having the already distorted sentences further disordered, came from the need to obtain more data, as most of the participants, despite being told to click words in random order, seemed to be still relying on some cognitive strategy, in agreement with the results obtained from the original Free Distortion Task experiment (Albertini, Tettamanti, Moro, 2015), in which it was shown how people rely on syntactic and semantic rules during the distortion of sentences.

At the end of this phase, each participant was given an explicit questionnaire, including items taken and adapted from the following standardized questionnaires:

- *General Health Questionnaire (GHQ-12)*, that measures the level of perceived mental distress, based on responses given to a four-point Likert-type scale (0 to 3), identify a severity level from 0 to 36 (Goldberg and Williams, 1988);
- *Depression anxiety stress scale (Dass-21)*, a self-administered questionnaire of twenty-one items, seven for each construct (depression, anxiety, and stress), which provides a score for each based on a four-point Likert-type scale (0 to 3) (Lovibond & Lovibond, 1995);
- *UCLA Loneliness Scale*, a four-point measurement scale, which, through twenty items, detects how lonely the individual feels by identifying four possible levels of loneliness (Russell, 1996).

Our questionnaire included a six-point response scale: 0 (very false); 1 (somewhat false); 2 (a little false); 3 (a little true); 4 (somewhat true); 5 (very true) and consisted of twenty-four items, six for each key dimension. Three for each group were in "reverse" mode (for example a reverse item for hypochondria is "I have been very little afraid of catching a disease"). A complete list of our questionnaire items is in Appendix 2.

3. Results

Preliminary general remarks

The following dependent variables were considered: total time spent distorting the whole sentence (TT), time to move the critical word (TC), degree of order (OD). Details on how the degree of distortion was calculated can be found in Appendix 3. In order to consider TC not only in absolute terms but in relation to the subject's average time, we also calculated the difference between TC and the mean time for moving the other words (DT).

Given the presumable variability among participants regarding their explicit perception of the impact that the four constructs had, we considered relating the personal level of reported anxiousness, hypochondria, depressiveness, and isolation of each participant to the values of the dependent variables of the main task (TT, TC, DT, OD). We computed for each construct and for each participant their mean questionnaire score, and then computed the correlation coefficient between the questionnaire score and the dependent variables mentioned above (i.e. their mean TT, TC, DT, and OD values). We calculated two separate averages for the final questionnaire scores, an overall average (Q) that included

responses to all items with both DIR and REV valence, and a different average (Q_v) that took into account the valence of each response. Nonparametric Spearman's rho was computed, which does not require knowledge of the parameters of the distribution and can be used with ordinal-level measures such as questionnaire scores. The times considered as TT, TC and DT were cleaned up by eliminating as outliers times greater than 2 ds from the average subject times.

The time taken to select and move the critical word (TC) and the average time taken to move that word relative to the average of the other words (DT) presumably indicate the salience of that word. If a positive correlation is found with the score for a certain construct in the explicit questionnaire, this means that participants who had expressed more concerns for that construct tended to leave out that word and put it toward the bottom of the distorted sentence. Conversely, a negative correlation would indicate a tendency for concerned participants to move the critical word as soon as possible. In both cases, it can be assumed that the existence of a correlation with the questionnaire indicates that in our task the detection of the time of moving a critical word may be an indicator of problematicity.

The degree of order (OD) indicates how ordered the resulting sentence from the distortion was. A positive correlation with the score of a certain construct on the final questionnaire would indicate that participants most affected by a certain construct put more rational processes into action, letting the syntactic automatism found by linguists prevail. Conversely, a negative correlation, indicating more distorted sentence construction, might reveal the prevalence of less rational processes and of the different automatism of letting go oneself to the feeling elicited by the sentence.

Correlations between performance in the distortion tasks and responses to the final questionnaire obviously indicate concordance between implicit and explicit processes. However, there may be correlations that do not involve the explicit responses given to the questionnaire, and these may instead reveal implicit aspects. An interesting result might be if a high correlation was found between the degree of sentence distortion and the time taken to move critical words. This might indicate that in certain cases, when the critical word had greater impact and was moved toward the end, more complex cognitive work was required to achieve greater order or distortion.

In addition to the general analysis, because the literature shows that there are important differences according to gender with regard to the variables considered, we considered it more worthwhile to perform the analysis considering in more detail the differences due to gender.

In fact, depression is more prevalent in women (Albert, 2015) and also perceived stress and health status (Anson et al., 1993; Costa et al., 2021), coping with stress (Graves et al., 2021) Golinelli et al., 2021, anxiousness (McLean et al., 2011), and, if one considers the situation generated by the covid as a traumatic event, it is worth noting that women are more affected by posttraumatic stress (Olf, 2017). On the contrary, the literature seems to show that males are more affected by the isolation (Vandervoort, 2000, Barreto et al., 2021, Umberson et al., 2022), especially when assessed with the UCLA scale, because of possible less satisfying relationships than those of women (Wiseman et al. 1995).

In the next sections we will proceed as follows. We will initially examine whether there were differences, in the two main tasks, between the times taken to distort sentences containing critical words and those containing neutral words. We will then examine, for each of the four constructs under consideration, the correlations between the scores on the final questionnaire and the variables considered in the analysis of the main tasks, noting the differences attributable to gender, and direct or reversed valence. Only significant correlations will be reported (full correlation tables with all details are in Appendix 5).

Critical sentences versus neutral sentences

The total time taken to distort a sentence presumably indicates how much the sentence had a critical impact, having required more processing. We therefore first examined whether there were differences between the *total mean processing times* for distorting sentences containing *critical* words and sentences with *neutral* words. As mentioned before, the times considered were cleaned up by eliminating as outliers times greater than 2 ds from the average subject times.

In Main 1 task, mean times were lower for neutral sentences (9239 ms) than for the others (9502 ms). This difference was not significant ($t = .87$, $df = 1447$, $p = .39$), but it should be considered that it was calculated on absolute times, whereas it is more appropriate, to account for individual variability to consider for each individual sentence the ratio of the time taken to distort it to the participant's overall average time. The times were again lower for neutral sentences (ratio .978) than for the others (ratio 1.004), and the difference was significant ($t = 2.45$, $df = 1447$, $p = .01$).

We repeated the same analyses with the Main 2 data, i.e., those derived from the distortion of the already distorted sentences. We again calculated ratio of total time (after removing outliers as above) spent on average on distorting neutral sentences to that for distorting the other sentences. Also in the second distortion, the ratio for distorting neutral sentences (.93) was significantly lower than that for distorting critical sentences (.98) ($t = 4.1$, $df = 1453$, $p < .001$).

This means that, although the length of all sentences was the same, namely 6 words, there was an effect of the critical sentences because on average the time taken to distort them was longer than the time taken to distort the neutral sentences. This was even more so in the Main 2 task, where the overall meaning of the sentences, already distorted, was less obvious and the critical words in them were more prominent.

Anxiousness

A paired t-test was performed on the difference between the average time taken to move the critical word (TC) related to anxiety and the average time taken to move the other words in sentence (TN) (full details are reported in Appendix 4). This difference was significant for female participants in Main1 both for direct items ($t(63) = 3.23$, $p < .001$) and for reversed items ($t(59) = 3.25$, $p < .001$). The TC-TN difference was also significant for male participants with reversed items only ($t(60) = 2.59$, $p = .01$). No difference was found in Main 2 for anxiousness.

Considering correlations with the final questionnaire, female participants who most expressed that they were anxious during the pandemic, took longer to complete the distortion for items denoting direct anxiety in Main 1 (TT-Qv $\rho = .356$). TT was also correlated with questionnaire items denoting reversed anxiety in Main 2 ($\rho = .366$). In addition, the more anxious female participants tended to put the critical word at the end of the scrambled sentence (TC-Qv $\rho = .361$ in Main 1, and TC-Qv $\rho = .368$ in Main 2), and also tended to postpone *reversed* anxiety words in Main 1 (TC-Q $\rho = .262$). This tendency to move the critical word well after the others also concerned males to a lesser extent, because there was a significant positive correlation between DT and questionnaire scores in Main 1 (DT-Qv $\rho = .330$).

Considering the degree of order, there was a negative correlation with reversed anxiety items in females in Main 1 (OD-Q $\rho = -.267$). This would mean that the more anxious female participants created more distorted sentences with the non-anxiety items in Main 1, but they did so with direct anxious items in Main 2 (OD-Qv $\rho = -.313$).

The fact that, for anxiety, effects regarding time to distortion completion, critical word shift, and degree of order affected female participants is in line with what we have seen being reported in the literature (McLean et al., 2011).

Also, in Main 2, the more the sentence denoting the inverse of anxiety was ordered, the longer it took females to move the critical word (OD-DT $\rho=.317$). To a lesser extent a similar thing occurred for males in Main 1 (OD-TC $\rho=.270$). This would mean that although the sentences containing words of reversed anxiety were more distorted by those who were more anxious, making them more ordered required more time and thus more processing.

Considering those female participants who explicitly admitted to having felt more anxious, we can say that their processing was affected more by the contrast between the two automatisms, since they processed sentences embedding critical words concerning these constructs in more time. This expansion of processing time affected especially the critical word, which these subjects tended to put toward the end of the sentence they constructed.

This was particularly the case in Main 2, when it came to distorting the original sentence, thus when the process needed to be more explicit and influenced by rational processing.

Depression

In contrast to what was found with anxiety, with regard to depression there were few correlations with the questionnaire and they affected only female participants. In Main 1, participants who indicated on the questionnaire that they felt more depressed were those who moved the word indicating the inverse of depression after the other words (DT-Q $\rho = .282$). In Main 2 they were faster to complete the distortion of the whole sentence when it contained a word denoting depression (TT-Q $\rho = -.337$) and especially distorted more the sentences indicating the inverse of depression (OD-Qv $\rho = -.398$).

Another relevant difference with respect to anxiety is that, for this construct, significant correlations were found between the degree of order of the resulting sentences in Main 1 and the time of displacement of the critical word relative to other words in females for both depression (OD-DT $\rho = .417$) and reversed depression (OD-DT $\rho = .374$). Significant correlations were also found for the absolute time of critical word shift (OD-TC depression $\rho = .304$, reversed depression OD-TC $\rho = .299$). Similar correlations also emerged for males, only for direct depression (OD-DT $\rho = .329$; OD-TC $\rho = .292$), and in this case the difference between the time of displacement of the critical word and that of the other words was also significant (585 ms, TC-TN $t(60) = 2.35$, $p = .02$).

This result indicates that although the correlations that emerged between the level of depression *explicitly* stated on the questionnaire and the variables considered at the FDT were low for females and null for males, in fact at the *implicit* level the effort to make the sentences more ordered was notable for all participants when their meaning was most evident i.e. in Main 1.

Hypochondria

The attention to health emerged remarkably when considering the difference between the mean time of displacement of the critical word and that of the other words. This difference was very significant for all participants and for both direct and reverse hypochondria (male, direct $t(62)=3.87$, reverse $t(55)=3.86$; female, direct $t(63)=2.20$, reverse $t(62)=2.43$).

Sentences concerning hypochondria in Main 1 tended to be more ordered by male participants who were more likely to have expressed having problems concerning illness (OD-Qv $\rho = .259$), and reversed sentences (i.e. concerning health) were shifted toward the end by these participants (TC-Q $\rho=.308$, DT-Q $\rho = -.282$). It seems that the effort to maintain syntactic automaticity here was prevalent over allowing a less rational process.

There were no significant correlations with regard to female participants in Main 1. Considering the correlations between measures, i.e. the more implicit side, however, very high correlations resulted

showing that, for participants of both genders, greater order was corresponding with greater time to shift the critical word (OD-DT male $\rho=.515$, female $\rho=.459$; OD-TC male $\rho = .393$).

In Main 2, the difference between males and females was even more pronounced. The time to move the critical word was directly correlated with hypochondria questionnaire scores for females (TC-Q $\rho = .306$). In reversed sentences, that is when the critical word was about health, the same phenomenon occurred (TC-Q $\rho = .279$; DT-Q $\rho = .270$).

This remarkable lengthening of time corresponding to more ordered sentences may be again interpreted as the effect of the conflict between the syntactic process highlighted by linguists, which being an automatism should produce fast responses, and the emotional impact elicited by the criticality of the sentence, which tends to increase the processing load.

Isolation

Also with regard to isolation, a significant difference was found between the displacement time of the critical word and that of other words for both genders and both valences (direct isolation females $t(63) = 3.46$, males $t(57)=2.56$; reverse isolation females $t(63)=3.30$, males $t(59)=2.58$). This difference affected all participants, but the correlation with the questionnaire emerged only for male participants and sentences with reverse isolation words. In Main 1, the distortion of sentences was completed faster by participants who experienced more distress from isolation during the pandemic (TT-Qv $\rho = -.280$) and this correlation was dramatically even greater in the second task (TT-Qv $\rho = -.592$, TC-Qv $\rho = -.515$).

Basically, it seems that the more high scores the male participants obtained about their concern for isolation in the pandemic, the quicker they were to select the word that denoted the opposite of isolation and thus tended to put it at the beginning of the distorted sentence. These males also constructed more orderly sentences (OD-Qv $\rho = .274$).

The peculiarity that emerged here was that although no correlation with the questionnaire was found for females, nevertheless noticeable correlations were found in Main 1 for the generality of females between the degree of order and times of displacement of the critical word, both direct (OD-DT $\rho = .313$) and reverse (OD-DT $\rho = .365$). This effect persisted in Main 2 with reverse items (OD-DT $\rho=.266$) and it also occurred for male participants with direct items (OD-DT $\rho = .303$, OD-TC $\rho = .327$).

As we have seen, young males are considered more affected by the isolation and inclined to admit it easily (e.g. Umberson et al., 2022) but there are contradictory theoretical positions about how willing females are to admit to feeling isolated. Our results show that the girls who admitted that they felt most isolated during the pandemic were not the ones who manifested longer times in distortion, nor in critical word shifting, nor did they built particularly ordered or disordered sentences. However, in general, the female participants spent more time, and thus more cognitive resources, in proportion to the degree of order they gave to their sentences, and this we think is an implicit indication of criticality regarding this construct.

4. Result summary and discussion

This paper investigated whether the free sentence distortion task, originally designed to show the incoercible tendency to maintain syntactic structures in a sentence even when asked to make them out of order, may reveal implicit biases concerning emotions or attitudes.

The first variable considered concerns the times taken to distort sentences with critical words related to the various constructs. We assumed that longer times relate to greater complexity of the overall processing of the sentence, resulting from the perception of its meaning as a whole. In fact, processing

times for critical sentences in many cases were actually longer for subjects who had experienced the issues expressed by the critical words.

A second aspect we have taken into account is the position in which the critical word tended to be placed, that is, whether toward the beginning or the end of the distorted sentence. This has been detected by considering the time taken to select it, which is greater the more the word is clicked after the others and thus placed toward the end of the sentence. In addition, measuring the time taken to move the critical word time by comparing it with the time taken on average to move the other words gives a more accurate estimate in relation to the subjective time spent on the task.

This measure can give us useful insights if we assume that delaying the shifting of a critical word might denote some difficulty related to the concept it expressed, and that therefore the participants who were more sensitive to a certain construct on the questionnaire (i.e., who experienced more anxiousness, more concern about health, etc.) also shifted the related critical words after the others.

Third, we considered the degree of order, whose lower value indicates a less ordered and therefore more distorted sentence. The question we asked was whether sentences expressing critical meanings are distorted more or less. This should indicate how much syntactic constraints, related to rational processing, prevail. Since the representation of the syntactic structure of sentences is processed spontaneously and automatically, according to Albertini et al. (2015), a chunking mechanism may be exploited to reduce the cognitive cost required to process responses. This process, however, may be interfered by another automatic process of a semantic nature, which may come into play when there is a word in the sentence that has a strong affective value (which we defined as a critical word), because it invokes feelings or emotions related to a psychological construct.

These two automatisms can act in concert or conflict, depending on the case. We would have expected that, if the effect of the valence of the critical word was strong, the tendency to maintain the order given by the syntax as much as possible would have been disrupted, and thus the sentence would have been made more distorted. In the majority of cases, however, the opposite case occurred, that the sentence instead was more orderly constructed, but in many of these cases higher average times for completing the distortion revealed that the processing cost was lower to maintain the structure than to change it.

The conflict between these two automatisms in our task was evidenced by the fact that the spontaneous tendency to create ordered sentences often remained active, but it was at the expense of increased processing time and thus increased expending of cognitive resources for sentences that were more critical to the participant. This was also evidenced by the increased processing time for critical constructs, a sign of increased processing complexity, and by how much impact the critical word had, detectable by the position in which it was placed in the sentence.

Another aspect that could contribute to increase the order of critical sentences is also the fact that the prominence of the target word concentrates the focus of attention more on the local level than on the global level. Thus more attention was paid to the syntactic links of these single words. If, as we hypothesized, critical sentence processing involves a conflict between two automatic tendencies, this can explain also what we noted earlier, that is that the overall times taken to complete sentence distortion are getting longer the more relevant the construct to which the target word refers is to a certain participant. This is indeed what happened in some cases, i.e. as we saw for anxiety in female participants.

The focus of attention on individual words at the local level occurred for certain constructs in the first task and for others in Main 2, but, as noted above, the perception that emerged in the second distortion condition can be considered even more implicit. What the second distortion task can tell us is that in

this task, having to start from an already distorted sentence, subjects focused more on individual words and thus the critical word may have taken on greater prominence. Correlations with questionnaire scores here can be attributed to a greater extent to the fact that the salience of individual critical words emerges even more, because in the second distortion the meaning of the sentence is blurred, less explicit or less manifest. In this sense, the perception of the meaning of these sentences is more connected to implicit processes. It can also be considered that the first sentence presentation may elicit more of a propositional representation and greater conscious control, while the already distorted sentence presentation may be considered more associative in nature (Hofmann, Gschwendner, & Schmitt, 2005; Hofmann, Gschwendner, Nosek, & Schmitt, 2005).

Anxiety was the construct for which the majority of correlations were found with the questionnaire, but instead few correlations were found between measures, an indication that the perception of the state of anxiety was essentially explicit and simply found confirmation in the indirect measure given by the FDT. Anxiousness was thus found to be the most cognitively demanding construct. Other constructs correlated less with the level of involvement resulting from the questionnaire for some participants, but correlations between the degree of order and processing times reveal that there were critical issues at play.

Finally, we can mention that some results we found concern correlations between the questionnaire score and "critical" words that do not express negative feelings but their opposite. We believe that these correlations are nonetheless of interest because, as we pointed out earlier, the positive and negative direction of words (e.g., distress vs. serenity) may still indicate a sensitivity of subjects to a dimension that may be expressed by words of opposite valence.

5. Conclusion

We can at this point ask what conclusions can be drawn from these results about the feelings experienced during the pandemic. We had wondered whether through the instrument of FDT we could ascertain whether there is an explicit awareness of the feelings and emotions experienced during or in relation to the pandemic or whether these have remained latent and unexpressed but perhaps continue to have an effect on the current affective and emotional state. The idea was to detect whether the cognitive automatism that would lead to maintaining as much syntactic structure as possible in the task of distorting a sentence prevailed, or the affective automatism that by interfering and eliminating this constraint would allow it to distort more easily and that would be even more evident in an already distorted sentence.

We can say that the FDT method generally highlighted the concerns and feelings experienced during the pandemic in the same direction as the explicit questionnaire. Therefore, the FDT has shown that affective states elicited by the pandemic situation may be temporally stable. This agreement between the explicit and implicit levels was found here when considering the generality of subjects, but the FDT may also prove to be a useful tool to highlight some implicit aspects at the personal level. In fact, for some subjects and for some constructs this correlation between their responses to the questionnaire and the tendencies manifested in the FDT was not present or even inverse.

This discrepancy may therefore have clinical significance, because in general terms, when there is a discrepancy between explicit and implicit tests, it can be assumed that it may relate to unaccepted feelings or attitudes, for reasons of social desirability or motivational bias (Nosek, 2007; Hofmann, Gawronski, Gschwendner & Schmitt, 2005; Hofmann, Gschwendner, & Schmitt, 2005). Thus, if the general trend were to be confirmed by further research, when the explicit results of a construct are at odds with the implicit results, it might mean that this construct has a problematic meaning for a

particular subject. In this sense, with regard to the more general use of FDT, this method might also have application interest in clinical settings.

All study procedures involving participants were in accordance with the ethical standards of the Italian Association of Psychology (AIP Associazione Italiana di Psicologia, https://aipass.org/wp-content/uploads/2023/02/Codice-Etico_luglio-2022.pdf).

Informed consent was obtained from all participants.

References

- Albert, P. R. (2015). Why is depression more prevalent in women?. *Journal of Psychiatry & Neuroscience: JPN*, 40(4), 219.
- Albertini, S., Tettamanti, M., Moro, A. (2012), The impossible chaos: When the mind cannot eliminate language structure, *USS Center for Neurolinguistics and Theoretical Syntax Ne.T.S.*, Pavia; *Division of Neuroscience and Department of Nuclear Medicine, San Raffaele Scientific Institute*, Milan.
- Albertini, S., Tettamanti, M., Moro, A. (2015), Sintassi e working memory: un nuovo paradigma di valutazione, *Sistemi Intelligenti*, XXVII, 1, 27-44.
- An, S., Ji, L. J., Marks, M., & Zhang, Z. (2017). Two sides of emotion: exploring positivity and negativity in six basic emotions across cultures. *Frontiers in Psychology*, 8, 610.
- An, S., Han, X., Wu, B., Shi, Z., Marks, M., Wang, S., ... & Han, S. (2018). Neural activation in response to the two sides of emotion. *Neuroscience Letters*, 684, 140-144.
- Anson, O., Paran, E., Neumann, L., & Chernichovsky, D. (1993). Gender differences in health perceptions and their predictors. *Social Science & Medicine*, 36(4), 419-427.
- Barreto, M., Victor, C., Hammond, C., Eccles, A., Richins, M. T., & Qualter, P. (2021). Loneliness around the world: Age, gender, and cultural differences in loneliness. *Personality and Individual Differences*, 169, 110066.
- Costa, C., Briguglio, G., Mondello, S., Teodoro, M., Pollicino, M., Canalella, A., ... & Fenga, C. (2021). Perceived Stress in a Gender Perspective: A Survey in a Population of Unemployed Subjects of Southern Italy. *Frontiers in Public Health*, 9, 640454.
- Goldberg, D. P., e Williams, P. (1988). *A Users' Guide To The General Health Questionnaire*. London: GL Assessment.
- Golinelli, D., Bucci, A., Boetto, E., Maietti, E., Toscano, F., & Fantini, M. P. (2021). Gender differences and multiple determinants of perceived physical and mental health in Italy. *Annali di Igiene Medicina Preventiva e di Comunità*, 33, 456-473.
- Graves, B. S., Hall, M. E., Dias-Karch, C., Haischer, M. H., & Apter, C. (2021). Gender differences in perceived stress and coping among college students. *PLoS One*, 16(8), e0255634.
- Hawryluck L., Gold W.L., Robinson S., Pogorski S., Galea S., Styra R. (2004). SARS control and psychological effects of quarantine, Toronto, Canada. *Emerg Infect Dis.*, 10: 1206–12.
- Hofmann, W., Gawronski, B., Gschwendner, T., Le, H., & Schmitt, M. (2005). A meta-analysis on the correlation between the Implicit Association Test and explicit self-report measures. *Personality and Social Psychology Bulletin*, 31(10), 1369-1385.

- Hofmann, W., Gschwendner, T., & Schmitt, M. (2005). On implicit–explicit consistency: The moderating role of individual differences in awareness and adjustment. *European Journal of Personality*, 19(1), 25-49.
- Hofmann, W., Gschwendner, T., Nosek, B. A., & Schmitt, M. (2005). What moderates implicit—explicit consistency?. *European Review of Social Psychology*, 16(1), 335-390.
- Jeong H., Yim H.W., Song Y.J., et al. (2016). Mental health status of people isolated due to Middle East respiratory syndrome. *Epidemiol Health*, 38:e2016048.
- Jolliffe, T., & Baron-Cohen, S. (2000). Linguistic processing in high-functioning adults with autism or Asperger's syndrome. Is global coherence impaired? *Psychological Medicine*, 30(5), 1169-1187.
- Kintsch, W. (1998). *Comprehension: A Paradigm for Cognition*. New York, NY: Cambridge University Press.
- Lovibond, P. F., & Lovibond, S. H. (1995). The structure of negative emotional states: Comparison of the Depression Anxiety Stress Scale (DASS) with the Beck Depression and Anxiety Inventories. *Behaviour Research and Therapy*, 33, 335-343.
- McLean, C. P., Asnaani, A., Litz, B. T., & Hofmann, S. G. (2011). Gender differences in anxiety disorders: prevalence, course of illness, comorbidity and burden of illness. *Journal of Psychiatric Research*, 45(8), 1027-1035.
- Nosek, B. A. (2007). Implicit–explicit relations. *Current Directions in Psychological Science*, 16(2), 65-69.
- Olff, M. (2017). Sex and gender differences in post-traumatic stress disorder: an update. *European Journal of Psychotraumatology*, 8(sup4), 1351204.
- Rude, S. S., Durham-Fowler, J. A., Baum, E. S., Rooney, S. B., & Maestas, K. L. (2010). Self-report and cognitive processing measures of depressive thinking predict subsequent major depressive disorder. *Cognitive Therapy and Research*, 34(2), 107-115.
- Russell, D. W. (1996). UCLA Loneliness Scale (Version 3): Reliability, validity, and factor structure. *Journal of Personality Assessment*, 66(1), 20-40.
- Tang, F., Liang, J., Zhang, H., Kelifa, M. M., He, Q., & Wang, P. (2020). COVID-19 related depression and anxiety among quarantined respondents. *Psychology & Health*, 1-15.
- Umberson, D., Lin, Z., & Cha, H. (2022). Gender and social isolation across the life course. *Journal of Health and Social Behavior*, 63(3), 319-335.
- Vaccaro, A. G., Kaplan, J. T., & Damasio, A. (2020). Bittersweet: the neuroscience of ambivalent affect. *Perspectives on Psychological Science*, 15(5), 1187-1199.
- Vandervoort, D. (2000). Social isolation and gender. *Current Psychology*, 19(3), 229-236.
- Wiseman, H., Guttfreund, D. G., & Lurie, I. (1995). Gender differences in loneliness and depression of university students seeking counselling. *British Journal of Guidance & Counselling*, 23(2), 231-243.
- Würtz, F., Zahler, L., Blackwell, S. E., Margraf, J., Bagheri, M., & Woud, M. L. (2022). Scrambled but valid? The scrambled sentences task as a measure of interpretation biases in psychopathology: A systematic review and meta-analysis. *Clinical Psychology Review*, 93, 102133.

Appendix 1 -Sentences

	Anxiousness		
1	A: Sai io abito vicino al mare (A: You know I live near the sea)	B: Sei davvero fortunato! In questo periodo è una gran fortuna (B: You are really lucky! At this time it is very good luck)	IL MARE PORTA UNA SERENITÀ UNICA (The sea brings a unique serenity)
2	A: Nell'ultimo anno ho fatto spesso meditazione (A: In the past year I have often done meditation)	B: E ne hai tratto beneficio? (B: And have you benefited from it?)	LA CALMA È UNA VIRTÙ PREZIOSA (Calmness is a precious virtue)
3	A: La giornata lavorativa del rider è estenuante (A: The rider's workday is exhausting)	B: Si non sai mai se e quanto lavorerai (B: Yes you never know if and how much you will work)	LE PERSONE CERCANO UNA STABILITÀ SODDISFACENTE (People seek satisfying stability)
4	A: Ultimamente mi capita di avere sbalzi d'umore (A: I've been experiencing mood swings lately)	B: Ti capisco me lo stanno dicendo in tanti (B: I hear you a lot of people are telling me that)	LE PERSONE PROVANO UNA ANGOSCIA INTERMITTENTE (People experience intermittent angst)
5	A: A scuola facevamo le prove di evacuazione (A: In school we used to do evacuation drills)	B: Saper coordinare tanta gente insieme non è facile (B: Knowing how to coordinate so many people together is not easy)	LA FOLLA PROVOCA UN PANICO GENERALE (Crowds cause a general panic)
6	A: Sei riuscito a raggiungere i tuoi obiettivi? (A: Have you been able to achieve your goals?)	B: Di recente ho avuto qualche difficoltà (B: Recently I have had some difficulties)	NON TROVARE UNO SCOPO RENDE IMPOTENTI (Not finding a purpose makes one helpless)
	Hypochondria		
7	A: Ho proprio voglia di andare a correre (A: I really want to go running)	B: Io ci vado abitualmente potresti cominciare (B: I usually go, you could start)	LO SPORT MANTIENE LA SALUTE FISICA (Sports maintains physical health)
8	A: Il mestiere del medico è complesso (A: The medical profession is complex)	B: Si deve tenere conto di molte variabili (B: You have to take into account many variables)	I SINTOMI SONO DEGLI INDICATORI IMPORTANTI (Symptoms are important indicators)
9	A: In montagna è faticoso raggiungere alte quote (A: In the mountains it is tiring to reach high altitudes)	B: Certo perché c'è carenza di ossigeno (B: Of course because there is a shortage of oxygen)	LA RESPIRAZIONE È UN GESTO IMPORTANTE (Breathing is an important gesture)
10	A: Secondo te l'anima sopravvive al corpo? (A: In your opinion does the soul survive the body?)	B: Personalmente si credo nell'Aldilà (B: Personally yes I believe in the Afterlife)	LA MORTE DETERMINA LA FINE TERRENA (Death determines the earthly end)
11	A: Ho sentito che Mario è stato ricoverato (A: I heard that Mario was hospitalized)	B: Ma aveva solo un raffreddore (B: But he only had a cold)	LA PATOLOGIA PUÒ AVERE ESITI INDESIDERATI (Pathology can have undesirable outcomes)
12	A: L'altro giorno mi sono tagliato sbucciando una patata (A: The other day I cut myself peeling a potato)	B: Basta un momento di disattenzione (B: All it takes is a moment of inattention)	UNA FERITA PUÒ CAUSARE INFEZIONI INATTESE (A wound can cause unexpected infections)
	Depression		
13	A: Mia madre mangia cioccolato abitualmente (A: My mother eats chocolate habitually)	B: Si sentirà più felice! (B: She will feel happier!)	LE PERSONE INSEGUONO LA FELICITÀ COSTANTEMENTE (People chase happiness constantly)
14	A: Non pensavo di farcela in quell'occasione (A: I didn't think I could make it on that occasion)	B: Meno male che la tua famiglia ti è stata vicino (B: Good thing your family was there for you)	UNA PAROLA PUÒ DARE CONFORTO MORALE (A word can give moral comfort)
15	A: Qual è la tua filosofia di vita? (A: What is your philosophy of life?)	B: Penso che il meglio debba ancora venire (B: I think the best is yet to come)	LA FIDUCIA È SEGNO DI OTTIMISMO (Confidence is a sign of optimism)
16	A: Sei già riuscito ad andare a cena fuori in questi giorni? (A: Have you managed to go out to dinner yet these days?)	B: No non avevo molta voglia (B: No I didn't feel much like it)	UNO STATO DI APATIA È FREQUENTE (A state of apathy is common)
17	A: Non mi scorderò mai le bellissime giornate al parco con mio nonno (A: I will never forget the beautiful days in the park with my grandfather)	B: Hai avuto la fortuna di condividere molto tempo con lui (B: You were lucky enough to share a lot of time with him)	LA MALINCONIA DERIVA DA MOLTI RICORDI (Melancholy comes from many memories)
18	A: Nell'ultimo anno c'è stato un aumento di furti domestici (A: In the last year there has been an increase in domestic burglaries)	B: Non c'è da sorprendersi visto l'aumento della crisi (B: This is not surprising given the increase in the crisis)	LA DISPERAZIONE PUÒ PRODURRE DECISIONI SBAGLIATE (Despair can produce bad decisions)
	Isolation		
19	A: Domani andrò ad una festa (A: I am going to a party tomorrow)	B: Caspita! Incontrerai molte persone (B: Wow! You will meet many people)	LA SOCIALITÀ ARRICCHISCE LE ESPERIENZE SOGGETTIVE (Sociality enriches subjective experiences)
20	A: Spesso a scuola alcuni bambini si isolano (A: Often at school some children become isolated)	B: Può essere complicato ma necessario risolvere tali situazioni (B: It can be complicated but necessary to resolve such situations)	E' IMPORTANTE FAVORIRE INTERAZIONI TRA BAMBINI (It is important to foster interactions between children)

21	A: Come ti trovi con il tuo nuovo lavoro? (A: How are you getting along with your new job?)	B: Bene anche se alcuni membri rimangono un po' in disparte (B: Good although some members remain a bit on the sidelines)	IL COINVOLGIMENTO DI GRUPPO È FONDAMENTALE (Group involvement is crucial)
22	A: Non tutti i detenuti ricevono lo stesso trattamento (A: Not all inmates receive the same treatment)	B: Dipende dal tipo di reato che hanno commesso (B: It depends on the type of crime they have committed)	ALCUNI DETENUTI VENGONO RINCHIUSI IN ISOLAMENTO (Some inmates are locked up in solitary confinement)
23	A: Ieri ho visto un documentario sui mammiferi (A: Yesterday I saw a documentary about mammals)	B: Ho sentito che non tutti sono ugualmente socievoli (B: I heard that not everyone is equally sociable)	GLI ORSI VIVONO IN SOLITUDINE CONTINUA (Bears live in continuous solitude)
24	A: Mio fratello non ama vedere tanti amici (A: My brother doesn't like to see many friends)	B: Dovresti convincerlo a uscire (B: You should persuade him to go out)	QUESTO ATTEGGIAMENTO È SEGNO DI INDIVIDUALISMO (This attitude is a sign of individualism)
	Neutral		
25	A: Hai mai sentito parlare di Italo Calvino? (A: Have you ever heard of Italo Calvino?)	B: Certo l'ho studiato a scuola (B: Of course I studied him in school)	I LIBRI RENDONO LE PERSONE COLTE (Books make people educated)
26	A: Questa settimana sono davvero stanco (A: I am really tired this week)	B: Lavorare in un ufficio deve essere stancante! (B: Working in an office must be tiring!)	I TELEFONI SQUILLANO IN MODO INSISTENTE (The phones ring persistently)
27	A: La carne è un alimento essenziale per la dieta (A: Meat is an essential food for the diet)	B: Non tutti la pensano così (B: Not everyone thinks so)	I VEGANI MANGIANO LA FRUTTA SECCA (Vegans eat nuts)
28	A: Quest'estate sicuramente andrò in vacanza (A: This summer I will definitely go on vacation)	B: Ma sai già dove? (B: But do you already know where?)	IL MARE È UNA META ESTIVA (The sea is a summer destination)
29	A: Se penso a come si è formato l'universo rimango esterrefatto (A: When I think about how the universe was formed I am amazed)	B: Lo sviluppo della terra è veramente un fenomeno affascinante (B: The development of the earth is really a fascinating phenomenon)	LE PIANTE HANNO BISOGNO DI ACQUA (Plants need water)
30	A: Quando visito una città mi piace assaggiare i piatti locali (A: When I visit a city I like to taste the local dishes)	B: Anche a me! La trovo una cosa molto curiosa e divertente (B: Me too! I find it a very curious and amusing thing)	IL PESTO È UN ALIMENTO GENOVESE (Pesto is a Genoese food)

Appendix 2 - Explicit questionnaire

	sentence	construct	polarity
1	Ho sentito che mi è mancata la compagnia (I felt that I lacked company)	ISOL.	NORM
2	Ho avuto qualcuno con cui parlare (I had someone to talk to)	ISOL.	REV
3	Mi sono sentito isolato dagli altri (I felt isolated from others)	ISOL.	NORM
4	Sono riuscito a trovare compagnia quando volevo (I was able to find company when I wanted to)	ISOL.	REV
5	Sono riuscito a tollerare di sentirmi solo (I could tolerate feeling lonely)	ISOL.	REV
6	Mi sono trovato ad aspettare che qualcuno mi chiamasse o mi scrivesse (I found myself waiting for someone to call or write to me)	ISOL.	NORM
7	Ho avuto poca paura di prendere un malanno (I had little fear of catching an illness)	HYPOC.	REV
8	Ho pensato di aver bisogno del medico anche se ritenevo di avere un semplice raffreddore (I thought I needed the doctor even though I thought I had a simple cold)	HYPOC.	NORM
9	Mi sono preoccupato facilmente per quanto riguarda la mia salute (I worried easily about my health)	HYPOC.	NORM
10	Gli altri hanno dimostrato comprensione quando stavo poco bene (Others showed understanding when I was unwell)	HYPOC.	REV
11	Ho avuto poca preoccupazione che un familiare si ammalasse (I had little concern that a family member would get sick)	HYPOC.	REV
12	Ho avvertito un senso di oppressione che mi rendeva pesante il respiro (I felt a sense of oppression that made my breathing heavy)	HYPOC.	NORM
13	Mi sono sentito incapace di provare delle emozioni positive (I felt unable to feel positive emotions)	DEPR.	NORM
14	Ho avuto un'estrema difficoltà nel cominciare a fare quello che dovevo fare (I had extreme difficulty in starting to do what I was supposed to do)	DEPR.	NORM
15	Non vedevo nulla di buono nel mio futuro (I could not see anything good in my future)	DEPR.	NORM
16	C'era sempre qualcosa che mi dava entusiasmo (There was always something that gave me enthusiasm)	DEPR.	REV
17	Ho trovato tanti motivi di ottimismo (I found many reasons for optimism)	DEPR.	REV
18	Ho sentito che la vita avesse comunque significato (I felt that life had meaning anyway)	DEPR.	REV
19	Mi sono sentito spaventato senza ragione (I felt frightened for no reason)	ANXIOUSNESS	NORM
20	Ho percepito alterazioni del mio battito cardiaco senza aver fatto uno sforzo fisico (I felt alterations in my heart rate without having made any physical exertion)	ANXIOUSNESS	NORM
21	Ho sentito di essere vicino ad avere un attacco di panico (I felt I was close to having a panic attack)	ANXIOUSNESS	NORM
22	In nessuna situazione ho temuto di andare nel panico (In no situation did I fear panic)	ANXIOUSNESS	REV
23	Sono riuscito facilmente a rilassarmi (I was easily able to relax)	ANXIOUSNESS	REV
24	In nessuna circostanza ho sentito tremare le mie mani (Under no circumstances did I feel my hands shaking)	ANXIOUSNESS	REV

Appendix 3 - Computing details for order-distortion

The degree of order or (inverse) distortion is calculated using Excel in this way:

- the position in the distorted sentence of each of the 6 words is calculated through the COMPARE function applied to the 6 times. Example:

=COMPARE(SMALL(\$A1:\$F1;1;\$A1:\$F1;0)

For example if the times in this matrix are

A	B	C	D	E	F
16597	17068	6980	14413	12724	15260

this function returns the position of the 1st smallest value, i.e. 3rd (column C in this example).

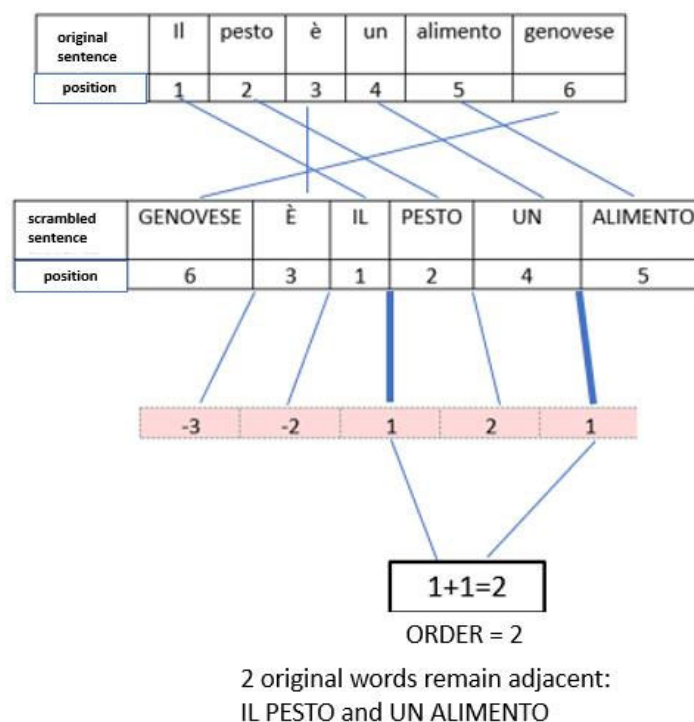
On the same set of times,

=COMPARE(SMALL(\$A1:\$F1;2;\$A1:\$F1;0)

returns the position of the 2nd smallest value, i.e., 5th (column E in this example).

The 5 transitions are then calculated, expressed as the difference between the position of one word and the next (e.g., transition1 = word1-word2, transition2 = word2-word3, etc.) . In this way, when two words are adjacent the distance in the order will be 1.

To have the variable ORDER, therefore, the number of "1's" present in the range of the 5 transitions will be summed using the function SUMIF. Example:



The degree of distortion then results from the average of the variable ORDER DEGREE (OD), where **the higher number indicates greater order** (more adjacent original words). **Zero would be maximum disorder, i.e., maximum distortion.**

Appendix 4 – Mean differences between TC and TN

Paired t-test of differences between the average displacement time of the critical word (TC) and the average displacement time of the other words (TN) in the sentence. Time outliers were discarded. Significant results are in bold.

MAIN 1

construct	TN average	TC average	mean difference	t	df	p
ANXIOUSNESS_F	7192.95	7872.19	679.24	3.23	63	< .001***
ANXIOUSNESS_F_REV	6697.93	7405.05	707.13	3.25	59	< .001***
ANXIOUSNESS_M	5097.13	5372.15	275.02	1.62	61	.11
ANXIOUSNESS_M_REV	5087.94	5609.59	521.65	2.59	60	.01*
DEPRESSION_F	7654.73	8205.51	550.78	1.64	60	.11
DEPRESSION_F_REV	6922.74	7152.84	230.10	1.00	62	.32
DEPRESSION_M	5267.59	5853.20	585.61	2.35	60	.02*
DEPRESSION_M_REV	5337.48	5720.68	383.21	1.82	59	.07
HYPOCHONDRIA_F	7430.11	8008.27	578.16	2.20	63	.03*
HYPOCHONDRIA_F_REV	7005.31	7636.98	631.67	2.43	62	.02*
HYPOCHONDRIA_M	5329.44	6245.49	916.05	3.87	62	< .001***
HYPOCHONDRIA_M_REV	5440.38	6510.59	1070.21	3.86	55	< .001***
ISOLATION_F	7821.29	8718.09	896.80	3.46	63	< .001***
ISOLATION_F_REV	6976.71	7755.13	778.42	3.30	63	< .001***
ISOLATION_M	5410.11	6000.84	590.74	2.56	57	.01*
ISOLATION_M_REV	5381.76	6052.25	670.49	2.58	59	.01*

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

MAIN 2

construct	TN average	TC average	mean difference	t	df	p
ANXIOUSNESS_F	4004.17	4129.97	125.80	.61	66	.54
ANXIOUSNESS_F_REV	3993.68	4256.32	262.64	1.26	59	.21
ANXIOUSNESS_M	3824.45	3885.84	61.39	.29	62	.77
ANXIOUSNESS_M_REV	3863.82	3936.69	72.87	.35	54	.73
DEPRESSION_F	4151.54	4704.54	553.00	2.08	64	.04*
DEPRESSION_F_REV	3881.11	3811.03	-70.07	-.30	58	.76
DEPRESSION_M	3606.88	3651.56	44.68	.18	58	.86
DEPRESSION_M_REV	3558.19	4160.17	601.98	2.48	59	.02*
HYPOCHONDRIA_F	3983.00	4770.56	787.55	3.04	60	< .001***
HYPOCHONDRIA_F_REV	3914.16	3901.28	-12.88	-.06	60	.95
HYPOCHONDRIA_M	3905.85	4061.69	155.84	.71	61	.48
HYPOCHONDRIA_M_REV	3734.91	4257.15	522.24	2.38	60	.02*
ISOLATION_F	3960.52	3812.57	-147.95	-.68	60	.50
ISOLATION_F_REV	4169.96	4490.37	320.41	1.25	61	.22
ISOLATION_M	3828.38	4010.30	181.93	.74	59	.46
ISOLATION_M_REV	3907.93	4122.71	214.78	.93	61	.35

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

Appendix 5 - Correlations

The following correlations (Spearman's rho) are shown:

TT-Q = Total time – Questionnaire

TT-Qv = Total time – Questionnaire (considering valence)

TC-Q = Time for moving critical word – Questionnaire (considering all items)

TC-Qv = Time for moving critical word – Questionnaire (considering valenced items)

DT-Q = Difference between TC and mean time for moving non critical words – Questionnaire (considering all items)

DT-Qv = Diff. betw.TC and mean time for moving non critical words – Questionnaire (considering valenced items)

OD-Q = Degree of order – Questionnaire (considering all items)

OD-Qv = Degree of order – Questionnaire (considering valenced items)

Only most significant correlations are shown (p in round brackets, chart reference in bold and square brackets)

Outliers are excluded in time measurements (TT,TC,DT)

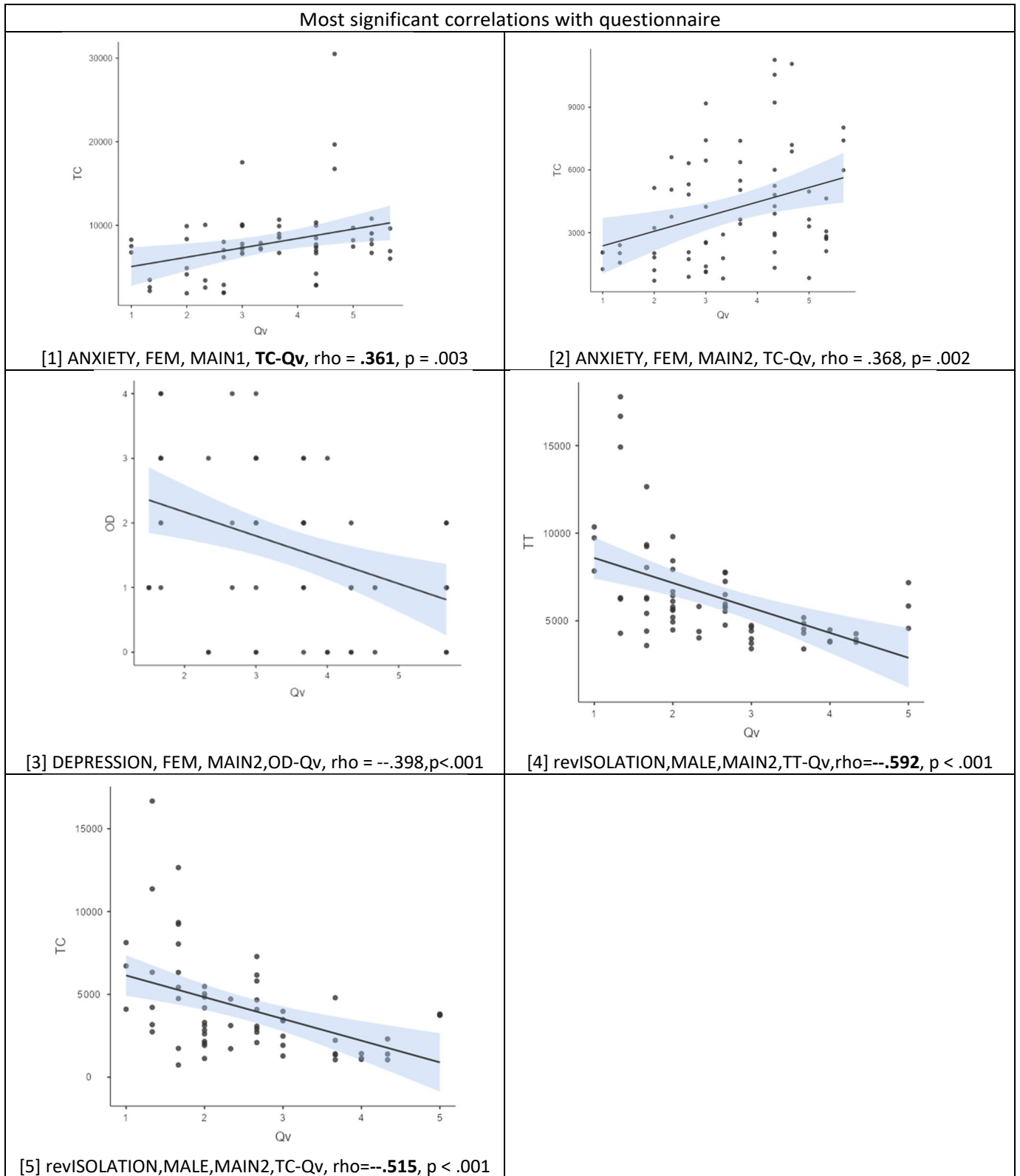
ANXIOUSNESS				
	MAIN 1		MAIN 2	
	correlations with questionnaire			
	M	F	M	F
TT-Q				rev .366 (.004)
TT-Qv		.356 (.004)		
TC-Q		rev .262 (.044)		
TC-Qv		.361 (.003)[1]		.368 (.002)[2]
DT-Qv	.330 (.009)			
OD-Q	rev -.267 (.034)			
OD-Qv				-.313 (.010)
	correlations between measures			
	M	F	M	F
OD-DT				rev .317 (.014)
OD-TC	rev .270 (.035)			

DEPRESSION				
	MAIN 1		MAIN 2	
	correlations with questionnaire			
	M	F	M	F
TT-Q				-.337 (.009)
DT-Q		rev .282 (.025)		
OD-Qv				rev -.398 (.001)[3]
	correlations between measures			
	M	F	M	F
OD-DT	.329 (.010)	.417 (<.001)[6] rev .374 (.003)		
OD-TC	.292 (.023)	.304 (.017) rev .299 (.017)		

HYPOCHONDRIA				
	MAIN 1		MAIN 2	
	correlations with questionnaire			
	M	F	M	F
TT-Q				.306 (.017)
TC-Q				rev .279 (.031)
DT-Q	rev .282 (.035)			rev .270 (.037)
TC-Q	rev .308 (.021)			
OD-Qv	.259 (.040)			
	correlations between measures			
	M	F	M	F
OD-DT	.515 (<.001)[7]	.459 (<.001)[8]		rev .276 (.031)
OD-TC	.393 (.001)[9] rev .295 (.027)			

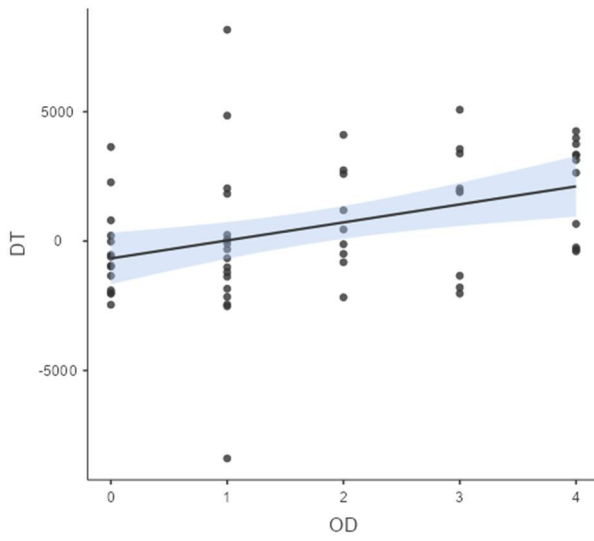
ISOLATION				
	MAIN 1		MAIN 2	
	correlations with questionnaire			
	M	F	M	F
TT-Q				
TT-Qv	rev -.280 (.030)		rev -.592 (<.001)[4]	
TC-Q				
TC-Qv			rev -.515 (<.001)[5]	
OD-Qv	.274 (.030)			
OD-Q			rev .298 (.018)	
	correlations between measures			
	M	F	M	F
OD-DT		.313 (.012) rev .365 (.003)[10]	.303 (.018)	rev .266 (.037)
OD-TC		rev .270 (.031)	.327 (.011)	

Appendix 6 – Charts*

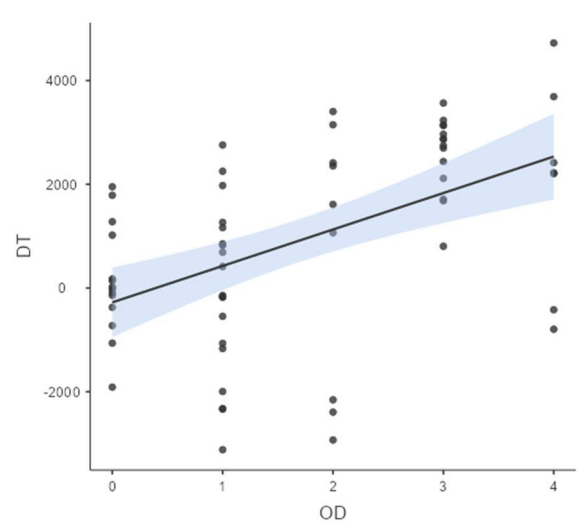


* Charts are made with Jamovi (Version 2.3.23) - The Jamovi project (2022), SCATR 1.2.0 module (Ravi Selker), <https://www.jamovi.org>.

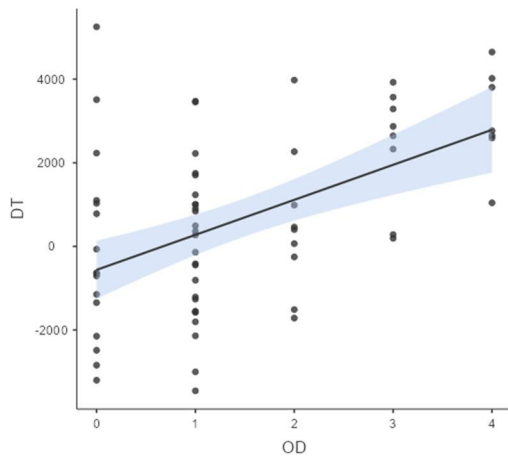
Most significant correlations between measures



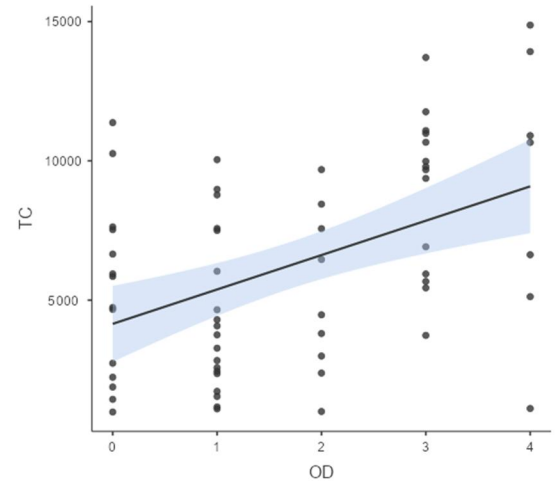
[6] DEPRESSION, FEM, MAIN1, OD-DT, rho = .417, p<.001



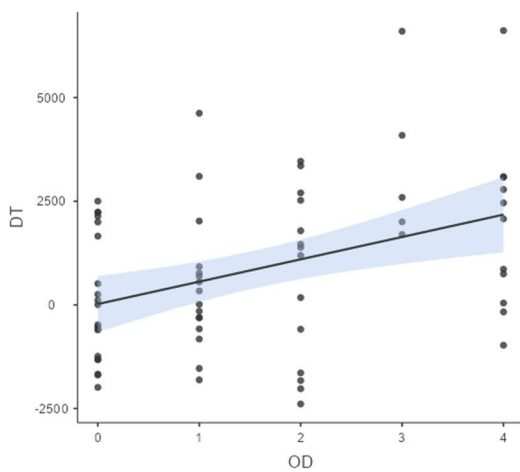
[7] HYPOC., MALE, MAIN1, OD-DT, rho=.515,p<.001



[8] HYPOC., FEM,MAIN1,OD-DT,rho=.459,p<.001



[9] HYPOC.,MALE,MAIN1,OD-TC,rho=.393,p=.001



[10] revISOLATION,FEM,MAIN1,OD-DT,rho=.365,p=.003