

# Expressive writing and linguistic analysis in women undergoing fertility treatment: an exploratory study on the possible association with medical outcome

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## Abstract

Background: Expressive Writing Intervention (EWI) asks people to write about a difficult experience, such as infertility, to help them to elaborate and cope with the emotional impact of the stressful event. Through the application of Bucci's referential process (RP) linguistic measures to infertile women's narratives, the general aim of the present study was to explore possible differences in linguistic aspects of RP relative to assisted reproductive technology (ART) treatment outcomes. Method: Thirty-five women underwent three sessions of EWI during ART treatment, writing for each time about their thoughts and feelings related to the event that they were experiencing. Afterwards, women were divided into two groups: ART positive outcome (n=10) and ART negative outcome (n=25). Results: Differences within groups were evaluated, and in the negative outcome group a significant reduction in Italian Weighted Reflection and Reorganization List scores during writing sessions emerged, thus indicating a reduction in the abilities of reflecting on the experience. From the post-hoc test with Holm's correction, the significant differences emerged between time 1 and time 3 ( $t=3.02$ ;  $p=.01$ ; Cohen's  $d=0.69$ ). As regards between groups differences, ART positive outcome group showed lower scores in Italian Sensory Somatic Dictionary than ART negative outcome group ( $p=.04$ ) in the third writing session. Conclusion: In conclusion, these preliminary findings based on the analysis of EWI narratives identifies the activation of different affective and defensive processes in relation to the different ART outcome.

**Keywords:** Expressive Writing Intervention, Referential Process, linguistic analysis, narratives, infertility, Multiple Code Theory

## Introduction

### Psychological interventions in infertility: the effectiveness of an expressive writing treatment

Infertility, defined as the failure to achieve a

clinical pregnancy after 12 months or more of regular unprotected sexual intercourse (World Health Organization [WHO], 2014), affects one in four couples in developed countries (WHO, 2017). Infertility is a distressing experience associated with many psychological consequences which can destabilize individuals and their interpersonal relationships (Chazan & Kushnir, 2019; Ho, et al., 2020; Zurlo et al., 2019).

Assisted reproductive technology (ART) refers to the full set of treatments, including the handling of eggs and/or embryos, that are undertaken with the aim of achieving a pregnancy (American Society for Reproductive Medicine [ASRM], 2015). These therapies give many couples who have been diagnosed with infertility a chance to have children, but they often reflect a long path that is often marked by numerous failures (Fisher & Hammarberg, 2012; Sut & Kaplan, 2015) and several stressful aspects (Galst, 2018). All of these may add to the already present physiological,

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emotional, and psychological burdens experienced by the infertile couple (LoGiudice & Massaro, 2018; Maroufizadeh et al., 2017), and may increase both the probability of quitting infertility treatment and of the probability of negative treatment outcomes (Luk & Loke, 2015; Peterson et al., 2007; Zurlo et al., 2019).

Psychosocial treatments for infertile couples have long been advocated, and their importance has been generally affirmed in the international literature (Boivin, 2003; Gamberio, 2015; Renzi et al., 2019). Psychological interventions can support infertile patients in coping more efficiently with the situation they are facing and also promoting their ability to describe and understand this difficult experience in greater detail. Moreover, psychological interventions may defuse maladaptive defensive mechanisms that emerge after a couple receives an infertility diagnosis, and help them face medical treatments with more emotional resources (Gameiro et al., 2015; Peterson et al., 2012; Sandoval et al., 2018), reducing distress, anxiety, and other emotional difficulties, and improving ART's pregnancy outcomes (Czamanski-Cohen et al., 2016; Facchinetti et al., 2004; Frederiksen et al., 2015; Karaca et al., 2019; Pasha et al., 2013).

A possible tool in the effort to make psychological interventions an integral part of medical infertility treatments might be found in Expressive Writing Intervention (EWI), a psychological intervention focused on written emotional expression that has produced beneficial effects in various clinical and non-clinical populations (Pennebaker, 1997; Pennebaker & Chung, 2007). EWI supports both a reflection on and a re-evaluation of the difficult experience: writing provides the opportunity to construct a coherent narrative, while acknowledging emotions, which are thereby brought into awareness and translated into words. This process promotes a new representation of the events in the individual's memory; the transformation allows for a different understanding of the experience and a fuller elaboration of the stressful events being described (Pennebaker & Chung, 2007; Solano et al., 2013). Therefore, EWI could offer an appropriate psychological intervention for women facing infertility and ART. To date, the research literature has been inconclusive, with some studies finding EWI to be effective in reducing infertility-related stress and depressive symptoms, and in promoting pregnancy rates (Frederiksen et al., 2017; Matthiesen et al., 2012; Renzi et al., 2019), while other studies have found no significant results on

stress or pregnancy rates (Panagopoulou et al., 2009). A possible explanation for these conflicting results is that individual differences (such as emotional competencies, defense mechanisms, coping strategies, etc.) can either facilitate or impede the elaborative process that writing can offer. A way to explore this hypothesis is to examine whether texts produced by people who underwent an EWI show stylistic differences, and if these features are related to EWI outcome variables.

### **Multiple code theory as a lens for observing and measuring emotional distress**

Bucci's Multiple code theory (MCT) is a theoretical model that has dealt with investigating different writing and verbalization styles. It states that one's communicative/narrative style can highlight different emotional and cognitive processes. Related linguistic analysis looks beneath the surface of speech and writing by relying largely on unconscious lexical choices, enabling researchers to identify how individuals reorganize their personal experiences cognitively (Bucci & Maskit, 2007).

According to Bucci (1997a; 1997b; 2001), humans use three systems to express information and construct images and representations: 1) subsymbolic; 2) nonverbal symbolic; and 3) verbal symbolic processing. In the subsymbolic system, multiple pieces of information are processed simultaneously in a comprehensive and analogical modality alongside continuous dimensions, which organize the affective core. This unconscious system is implicated in recognizing nonverbal communication, such as identifying a familiar voice, or performing creative work. The nonverbal symbolic system works with discrete images or representations that take shape from the continuous process of subsymbolic experience. Lastly, in the verbal symbolic system, these images and representations are transformed into words. Any recoding processing from one system to another cannot involve all material, because each system maintains its own specificity and works in parallel.

Bucci (1997a) proposes that these three types of processing systems are interconnected by the referential process (RP). The RP is a set of functional stages representing the process of linking nonverbal material into a form that can be communicated to others through language (Bucci, 1997b; 2001; Bucci et al., 2015). This process is bidirectional, in that expressive entities that are verbal in nature (such as words spoken or read by others) can be recoded back into nonverbal forms.

Mental images facilitate the connection of multimodal, subsymbolic experiences into articulated thoughts. Bucci posits that in the context of psychological interventions like psychotherapy or EWI, RP operates to change emotional schemas through sequential occurrence and reiteration of three major phases: emotional arousal, narrating/symbolizing, and reflecting/reorganizing.

Within each emotion schema, the sub-symbolic mode constitutes the “affective core,” and it is linked to the symbolic non-verbal and verbal systems by the RP. When the RP is interrupted by specific internal conflicts or traumatic events—understood as a range of chronic as well as acute events—the verbal and non-verbal systems within the schemas will be disconnected. This induces a blockage in the organization of the schemas, self-emotional regulation, and the construction of meanings of affective experiences. RP blockages or disconnections create a dysregulation process, such as strong psychological or somatic symptom activation (Bucci, 1997b; Solano, 2010; 2019). Pathology, both mental and physical, is viewed in the MCT (Bucci & Cornell, 2021) as deriving from different levels of disconnection, as these processes underlie all emotional disorders.

In this theoretical framework, infertility distress is understood as a trigger of emotional disconnection, since infertility is sometimes experienced as a traumatic experience (Galst, 2018). Prior research has shown that infertile women have a harder time controlling feelings and expressing their affective states than other women, which has been linked to an increased risk of psychopathology (Gross et al., 2011). While a defense mechanism like RP disconnection can help individuals overcome practical hurdles to reach the goal of pregnancy, in its more severe forms it could interfere by preventing people from identifying and functionally reorganizing their emotional experiences, regulating their emotions coherently, or reacting somatically or psychologically.

In order to overcome the disconnection of RP, psychological interventions, including expressive writing, should reconnect the sub-symbolic to the symbolic system—in other words, reorganize emotional schemas and link emotional and somatic experiences to imagery and words.

### Aims of the Present Study

Computerized RP linguistic measures have been applied to women’s expressive narratives with the general aim of investigating the linguistic aspects of RP in relation to ART outcomes. The first aim is to

verify if the RP’s linguistic measures evaluated in the three EWI sessions highlight distinct patterns for women that have reached a positive or negative ART outcome. Specifically, it is hypothesized that different processes, indicating different capability of reflect/reorganize the ART experience and the defence to face the event, will emerge within the groups. The second aim is to explore possible differences between ART outcome groups in the linguistic measure, in the different phases of EWI procedure.

## Materials and Methods

### Participants

Participants were recruited from groups of women who were undergoing ART, according to the following inclusion criteria:

- Undergoing an in-vitro fertilisation procedure;
- Attending the first medical appointment prior to beginning a given cycle of ART;
- Performing all medical check-ups at the centre;
- Undergoing the ART treatment for a fertility issue.

Women with a history of mental conditions, women who couldn’t understand or write in Italian, and/or women who had previously engaged in an ART cycle were excluded. Thirty-five women completed the protocol. The two groups of women were homogenous in continuous and discrete socio-anamnestic variables, as evaluated through the one-way analysis of variance (ANOVA) and Chi-square tests respectively (see Table 1). The pregnancy rate was 28.5%, with 10 positive and 25 negative outcomes.

### Measures

#### *Socio-demographic questionnaire*

A socio-demographic questionnaire was designed to collect information concerning age, social status, education level, occupational activity, and ART outcome.

#### *Computerized referential process linguistic measures*

The *Discourse Attribute Analysis Program* (DAAP; Maskit, Bucci, & Murphy, 2012; Bucci, 2021; Maskit, 2021) is a computer software program that compares any form of text to lists of words (known as dictionaries) in order to evaluate the proportion of certain words in the text, as well as the volume with which a speaker is talking about a particular construct. The above is accomplished by the use of “weighted” dictionaries, in which specific terms that are more closely related to a construct’s core components would have higher “weights” than

words that are less closely related to the construct. We used several dictionaries and derived measures developed and validated for the Italian language in our research. (see Table 2).

### **The Italian Weighted Referential Activity Dictionary (IWRAD)**

IWRAD is a computerized measure of RA (Mariani et al., 2013) in the Italian language. It includes a list of 9,596 commonly used Italian words, each with a weight of 0 to 1, with .5 serving as the neutral meaning (see Table 2). A high score indicates that the speech sample has a high degree of referential activity (RA), which correlates to concreteness, precision, clarity, and imagery. The IWRAD's power to assess a specific linguistic style and to reflect the unintentional dimensions of emotional participation contributes to its importance (for a deeper discussion see Maskit, Bucci, & Murphy, 2012 and Maskit & Murphy, 2011).

### **The Italian Weighted Reflection and Reorganization List (IWRRL)**

IWRRL is a computerized measure of the reflection and reorganization process in the Italian language that represents one of the major phases of the RP (see Table 2). It includes a list of 1,633 widely used Italian words, each with a weight ranging from 0 to 1, with .5 serving as the neutral meaning (Negri et al., 2018). A high score on IWRRL indicates that the speaker has a high level of competence in speech reorganization and reflection, which refers to the degree to which the speaker is attempting to recognize and understand the emotional meaning of a series of events in their own or another's life, or in a dream or fantasy. Through IWRRL, it can be detected and modelled the reorganizing phase of the referential process (Mariani & Hoffman, 2021).

### **The Italian Reflection Dictionary (IRefD)**

IRefD consists of Italian words referring to cognitive or logical functions and to communication processes that imply the use of cognitive functions (see Table 2). It is a measure of abstract reflection and distancing from emotional experience and corresponds to the proportion of IRefD words present in the speech. The IRefD measure is a good predictor of defensive intellectualizing in psychotherapy process studies (Mariani & Hoffman, 2021; Murphy, Maskit, & Bucci, 2015).

### **The Italian Sensory Somatic Dictionary (ISensD)**

ISensD is a list of Italian terms that have to do

with the body and bodily functions, as well as sensory processes and/or symptom explanations (Di Trani, et al, 2018). The arousal of bodily, sub-symbolic aspects of emotion schemas is measured by the amount of ISensD words in a speech sample (see Table 2). The ISensD measures are strictly related to the severity of symptoms and mood disorders (Mariani et al., 2020).

### **The Italian Sum Affect Dictionary (ISAffD).**

ISAffD includes Italian terms that describe how people feel and express their emotions. It includes emotion marks, functions related to affective arousal, and terms suggesting a positive or negative emotional response (see Table 2). Emotional control and arousal processes are linked in the affect dictionary. (Murphy, Maskit, & Bucci, 2015).

### **Pregnancy outcomes**

A sustained positive (3IU/mL) human chorionic gonadotropin (hCG) level accompanied by ultrasound confirmation of clinical pregnancy was considered a positive pregnancy outcome. A negative pregnancy result was described as a low hCG level, the lack of ultrasound confirmation of a clinical pregnancy, or the failure to continue the medical procedure with embryo transfer.

### **Procedure**

The present study was conducted between January 2015 and January 2017. The work was carried out in accordance with the code of ethics of the World Medical Association (Declaration of Helsinki) for experiments involving humans. Ethical approval was granted by the Ethics Committee of our University Department. The gynaecologist screened patients for eligibility during clinical evaluation, with the exclusion/inclusion criteria being routinely explored. After the first medical visits, the gynaecologist introduced the psychologist responsible for the research protocol implementation to the eligible women. The study participation has been proposed to all the eligible women (n=42) attending the medical centre in the period of study's conduction. The women who agreed to participate were 35 (one woman was not included in the investigation due to difficulties in writing in Italian, while six declined) and they signed an informed consent form before filling in the socio-demographic questionnaire and completing the first writing session. During the next two medical visits in the ART medical centre, the women completed the EWI protocol. The writing instructions were adapted for this clinical population (Pennebaker, 1997), asking women to

write for a maximum of 20 minutes about their deepest thoughts and feelings about the experience of assisted reproduction technology treatment that they were experiencing.

### Statistical Analyses

All statistical analyses were performed using the Statistical Package for Social Science (SPSS version 25), Jeffrey's Amazing Statistics Program (JASP version 0.10.2) and JAMOVI (version 0.9) software. Based on the ART procedure outcome, the group of women who wrote was divided into two sub-groups, with positive and negative outcomes, respectively.

A series of ANOVAs for repeated measures was used to evaluate differences in RP linguistic variables during the three EWJ sessions separately within each group of participants (ART positive and ART negative outcome). Prior to each analysis, sphericity assumptions were tested and no violations were detected. Post-hoc tests were conducted in order to probe differences within groups, and Holm's correction for multiple comparisons was applied. Cohen's *d* values, rank-biserial correlation measures and partial eta squared were computed in order to obtain standardized effect sizes. Additionally, nonparametric Man-Whitney U-tests were performed in order to evaluate possible differences in the two groups of women in RP linguistic variables at every phase of the writing procedure. A *p* values < .05 were considered statistically significant.

### Results

As regards within-group differences in RP linguistic measures during three sessions of EWJ, in the negative outcome group a significant reduction in IWRRRL scores during writing sessions emerged (see Table 3). The post-hoc test with Holm's correction showed that the significant differences emerged between time 1 and time 3 ( $t=3.02$ ;  $p=.01$ ; Cohen's  $d=0.69$ ).

Furthermore, in the group of women with positive outcomes, partial eta squared values indicated good effects at the .06 level of significance for ISensD (see Table 3). Through the post-hoc test with Holm's correction, the differences display moderate effect sized but, due to small clinical sample sizes, they were not statistically significant at the traditional .05 level. These differences emerged between time 1 and time 2 ( $t= -2.17$ ;  $p=.09$ ; Cohen's  $d=0.69$ ) and time 2 and time 3 ( $t= 2.35$ ;  $p=.09$ ; Cohen's  $d=0.74$ ), showing an increasing of the score at time 2,

respect to time 1 and 3.

As regards between-group differences in RP linguistic measures, a significant difference in ISensD scores was found for the third writing session in the direction of lower scores in the positive outcome group, compared to the negative outcome group (see Table 4).

Table 5 presents clinical examples of statements made by women with negative and positive ART outcomes in order to qualitatively observe differences in the elaborative and defensive processes. We selected the EWJ texts associated with the women who reported respectively the highest and the lowest score in the measures significantly connected to ART outcome: IWRRRL in Time 3 (as regards within groups differences) and ISensD in Time 3 (as regards between groups differences).

### Discussion

The purpose of the present work was to explore the expressive writing productions of women in ART treatment through the analysis of the referential process within the MCT framework—above all, to investigate how the linguistic process, understood as an embodied process, can be different in women who obtain positive and negative outcomes. MCT highlights how the linguistic process is a complex process intertwined with neurophysiological and psycho-corporeal processes (Iskric et al., 2020). Several studies highlighted a close link between language, psychopathology, and somatic diseases (Baddeley et al., 2011; Baddeley et al., 2016; Di Trani et al., 2018). According to this theoretical frame, language can be considered as an indicator of mind-body functioning and, through it, researchers can examine psychological processes (Dove, 2014). Through the application of RP linguistic measures on EWJ protocols, it has been found that affective and linguistic functioning in women who undergo ART was different according to the outcome of the medical procedure. The EWJ process in the two groups (positive and negative outcomes) underscored two different emotional processes.

Specifically, the results showed a different process in the reorganization measure (IWRRRL score), but not in the symbolization measure (IWRRAD score). In particular, just the women in the negative outcome group seemed to show a statistically significant decrement of reflection and reorganization functions. This result could be interpreted as a difficulty in maintaining emotional elaboration during the medical treatment, being able to reflect on it, and reorganizing the



uncertainty of outcome and the stress provoked by the invasive protocol. Observing the process evaluation of the EWI in the three stages, it appears that in relation to the ART outcome, the RP is triggered differently. This finding opens up many reflections that could be further discussed. They may indicate potential psychological variables that interfere with the ART results, as well as indicate when language is constantly connected to its physiological and body processes. It is also interesting that differences in IWRAD during the EWI sessions did not emerge. In this light, it seems relevant to help women not only to evoke or be in contact with their emotional experience, but also to help them to reorganize it. In other words, the reorganization phase in MCT is the core of the psychological changes, and therefore it is likely that the high level of stress and desire connected to ART require psychological restructuring and emotional reorganization in order to avoid strong psychological defenses. Reading these results from the MCT framework, it seems that when women in ART treatment deal with the desire to have a child, the arousal of this activation might activate a certain symbolizing process; however, an RP circle through the arousal-symbolizing-reorganizing phase is blocked in the third phase. The strong feelings could produce at some level a disconnection process and stop a reorganizing phase. In fact, the positive outcome group showed more stable capacity to reflect during sessions and fewer sensory-somatic words. This aspect is commonly connected to the reductions of depressed feelings, meaning that the writing process helped to support the emotional elaboration of distress.

The second aim concerned the exploration of the differences between women who obtained a favourable or unfavourable result for ART in each writing stage. The major difference resulted to the third stage of writing. In fact, in the third writing phase, the successful group scores significantly lower than the other group on the sensory-somatic dictionary (ISensD). This data is particularly interesting in light of the fact that, in previous studies, this measure was strongly correlated with depressive disorder and somatization (Mariani et al., 2020). Therefore, obtaining a lower score at the end of the intervention confirms not only the effectiveness of the EWI, but also a receptive difference to the intervention in the two groups. This result highlights how different defense mechanisms or levels of psychopathological dysfunction can interfere with the ART outcome, and also highlight how psychological interventions

can facilitate the processing of the stressful experience.

When analysing the clinical vignettes of women with negative and positive ART outcomes, some different emotional processes can be qualitatively observed (see Table 5). The within groups analysis showed a decrement in IWRRL scores in the negative outcome group with the lowest scores in the third writing session. At Time 3, comparing the woman reporting a positive outcome and the highest IWRRL scores to woman reporting a negative outcome and lowest IWRRL scores, it was evident different kind of narrative style (see Table 5). The first example showed a process of acceptance of the desire for the potential child, and that she was aware of uncertainty and reflecting on her sense of maternity. At Time 3, the woman reporting a negative outcome and the lowest IWRRL score showed difficulties in being in the writing experience. Instead of reflecting on the complex experience she was dealing with, she was curtailing the reorganization process, and trying to figure out how to deny the unsuccessful outcome. The second group of clinical vignettes reports some examples with the highest and lowest scores in the ISensD at the third time of writing (see Table 5). As before there were evidences of different style of writing in a specific way a lot of emphasis and anxiety in the examples with negative outcome examples, associated with higher ISensD values, in the second group, on the other hand, there is a greater positive and contained vision of the stressful experience linked to the invasive process of ART. Both groups of clinical vignettes represent a strong connection to negative and anxious thinking to this sensory-somatic dictionary (ISensD). This finding deserves further investigation that allows us to relate the different emotional processes related to stressful experiences.

Several limitations can be pointed out for the present study. First, the sample was small, which was partly due to the choice of performing the writing sessions in the medical centre in the presence of the psychologist and to both timing and emotional efforts required in the EWI studies. As regards the sample size, also the differences in the number of participants between the two groups (10 vs 25) can represent a limit which is partly due to the low ART success rate that determines in the same period of time many more participants reporting a negative outcome than those reporting a positive outcome. Future studies should thus incorporate a larger number of participants. A second limitation was the inclusion of only female participants. In future studies, it would be

interesting to include male partners as well. This appears to be relevant considering that male partners' characteristics, such as coping strategies, distress levels, and sexual concerns can also affect their female partners' stress, quality of life and sexual satisfaction (Donarelli et al., 2016; Nakić Radoš et al., 2020; Peterson et al., 2009). Third, our choice to use the same instructions for all three writing sessions could have presented a problem. In a future study, it may be important to propose three different writing instructions, one for each session, in order to explore the issue more thoroughly. Fourth, the participants were only recruited from a fertility clinic, thus potentially introducing a selection bias. Fifth, there was an absence of an assessment of psychological dimensions that in future studies should be investigated. Specifically, it could be interesting to explore dimensions of the couple's relationship, psychopathological symptoms, and emotional competencies, considering that these elements may play a role in the association between linguistic processes and ART outcomes.

### Conclusions

This work aimed to understand the delicate relationship between mind-body and language. In the MCT, language is an expression of the psychobiological functioning of the organism, and it can be an indicator for understanding the complicated levels of affective processing. The current results indicated that affective, linguistic, and bodily processes are closely linked to one another. This aspect should be better documented, and more research should address these issues, in order to increase the availability of information and tools that improve health interventions to support people during invasive medical treatments like ART. The abilities of people to process the information associated with difficult events and their ability to reorganize the experience can affect their health/pathology condition. The capability or the difficulty to be fully in contact with the experience and with its emotional implications can interfere with the medical process, facilitating or reducing its effectiveness. For example, in the past, importance has been placed on the concept of compliance with medical treatment, noting that greater collaboration between patient and doctor entailed greater efficacy of treatment. However, the concept of collaboration in treatment from a psychological point of view cannot exclude deeper elaborative processes, which imply emotional conflicts and psychological ambivalences that can be accentuated by the invasiveness and stress of

medical intervention. In other words, a person's defensive style from a psychological point of view can have an influence on the treatment and reduce its effectiveness even if there is full collaboration and adherence to the intervention protocol. This work, therefore, suggests that considering this internal level of affective processing at the beginning of the ART intervention might provide useful information on how to help women elaborate on and understand the difficult feelings that are activated in relation to the uncertainty of whether or not they will be able to have a child. A basic evaluation of affective defenses, together with a protocol that facilitates the expression of the affective experience through sessions of emotional writing, could incentivize women to stay in touch with these feelings, and, thereby, be better able to reflect and reorganize the experience.

### Declaration of interest

The authors declare that they have no conflict of interest.

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Table 1. Socio-demographic characteristics of the sample

Variables	Positive outcome group N=10		Negative outcome group N=25		F	P
	M	sd	M	sd		
Age	35.10	3.61	36.60	5.52	0.619	.437
Number of previous attempts	1.70	1.88	1.84	2.54	0.043	.838
Infertility duration (years)	2.20	1.22	2.08	1.65	0.025	.876
	%	n	%	n	$\chi^2$	P
<b>Social status:</b>						
Married	90%	9	80%	20	0.503	.649
Cohabitant	10%	1	20%	5		
<b>Educational Level:</b>						
8 years	10%	1	0%	0	3.570	.168
13 years	50%	5	36%	9		
≥16 years	40%	4	64%	16		
<b>Employment status:</b>						
Employee	60%	6	56%	14	0.700	.873
Freelance	30%	3	24%	6		
Housewife	0%	0	4%	1		
Unemployed	10%	1	16%	4		

\*p<.05

Table 2. Examples of words belonging to Italian linguistic measures of the referential process

<b>IWRAD</b>
High weight: odore (smell); maledetto (damned); urla (scream); stupore (astonishment); baciare (to kiss). Medium weight: il (the); capisci (you understand); io (I); lei (she), ciò (that); tu (you). Low weight: superficiali (superficial); parlavamo (we talked); ansiosa (anxious); capiscono (they understand); carini (nice).
<b>IWRRL</b>
High weight: anticipazione (anticipation); impedisce (prevent) spensierata (carefree) bisogni (needs) simbolicamente (symbolically). Medium weight: no (no); chiaramente (clearly); discorso (speech); logicamente (of course); problemi (problems). Low weight: sapendo (understanding) adulto (adult) nascosta (hidden) separazione (separation) dipende (it depends).
<b>IRefD</b>
Attenzione (attention), capire (to understand), decisione (decision), dubbio (doubt), meditare (to meditate), ragione (reason), razionalità (rationality), ricordo (memory).
<b>ISensD</b>
Ammalato (sick), digerire (digest), disorientamento (disorientation), dolore (pain), impotente (impotent), innervosito (unnerved), pesare (to weigh), ridere (to laugh), sintomi (symptoms), vomitare (to throw up).
<b>ISAffD:</b>
Sum of Affect Dictionaries as global affect list: Positive -Abbracci (hugs), affidabile (reliable), baciare (to kiss), felice (happy); Negative - Abbandonato (abandoned), depresso (depressed), impaurito (frightened), Neutral - Attesa (expectation), bisogno (need), coinvolto (involved), eccitato (excited)
Note: IWRAD = Italian Weighted Referential Activity Dictionary; IWRRL= Italian Weighted Reflection and Reorganization List; IRefD = Italian Reflection Dictionary; IDFD = Italian Disfluency Dictionary; ISensD = Italian Sensory-Somatic Dictionary; ISAffD = Italian Dictionary of respectively Sum of Positive, Negative, Neutral Affects.

Table 3. Differences in the writing process within group with negative and positive medical outcome

	Time 1		Time 2		Time 3		Within Group F-ratios	p	$\eta^2_p$
	Writing session 1		Writing session 2		Writing session 3				
	M	sd	M	sd	M	sd			
<b>Negative outcome group</b>									
<b>N=25</b>									
IWRAD	0.4970	0.005	0.4978	0.006	0.5003	0.008	1.41	.25	.058
IWRRL	0.5554	0.006	0.5518	0.007	0.5498	0.007	4.67	<b>.01*</b>	.169
ISensD	0.0582	0.024	0.0594	0.028	0.0610	0.028	0.08	.92	.003
ISAffD	0.0718	0.033	0.0682	0.025	0.0681	0.029	0.21	.81	.009
IRefD	0.0422	0.021	0.0327	0.018	0.0367	0.025	1.41	.25	.058
<b>Positive outcome group</b>									
<b>N=10</b>									
IWRAD	0.4949	0.006	0.4943	0.012	0.4985	0.006	1.24	.31	.121
IWRRL	0.5528	0.007	0.5540	0.008	0.5502	0.006	0.96	.40	.096
ISensD	0.0419	0.015	0.0647	0.043	0.0400	0.022	3.42	<b>.06</b>	.275
ISAffD	0.0664	0.020	0.0802	0.040	0.0729	0.027	0.39	.68	.042
IRefD	0.0310	0.020	0.0388	0.024	0.0410	0.022	0.66	.53	.069

\*p&lt;.05

Note: IWRAD = Italian Weighted Referential Activity Dictionary; IWRRL= Italian Weighted Reflection and Reorganization List, IRefD = Italian Reflection Dictionary; IDFD = Italian Disfluency Dictionary; ISensD = Italian Sensory-Somatic Dictionary; ISAffD = Italian Dictionary of respectively Sum of Positive, Negative, Neutral Affects;  $\eta^2_p$ = **Partial Eta Squared**.

Table 4. Non parametric analysis of differences between groups with negative and positive medical outcome in the linguistic measures in each of three-time sessions

	Negative Outcome Group N=25		Positive Outcome Group N=10		Statistics Mann-Whitney U test	p	Between-Groups Effect size <sup>a</sup>
	M	sd	M	sd			
<b>Writing session 1</b>							
IWRAD	0.4970	0.005	0.4949	0.006	154.00	.30	.23
IWRRL	0.5554	0.006	0.5528	0.007	140.00	.60	.12
ISensD	0.0582	0.024	0.0419	0.015	172.50	.08	.38
ISAffD	0.0718	0.033	0.0664	0.020	125.50	1.00	.00
IRefD	0.0422	0.021	0.0310	0.020	164.50	.15	.32
<b>Writing session 2</b>							
IWRAD	0.4978	0.006	0.4943	0.012	142.00	.55	.14
IWRRL	0.5518	0.007	0.5540	0.008	101.00	.40	.19
ISensD	0.0594	0.028	0.0647	0.043	120.50	.88	.04
ISAffD	0.0682	0.025	0.0802	0.040	108.50	.55	.13
IRefD	0.0327	0.018	0.0388	0.024	99.00	.35	.21
<b>Writing session 3</b>							
IWRAD	0.5003	0.008	0.4985	0.006	140.00	.47	.17
IWRRL	0.5498	0.007	0.5502	0.006	111.00	.75	.07
ISensD	0.0610	0.028	0.0400	0.022	173.00	<b>.04*</b>	.44
ISAffD	0.0681	0.029	0.0729	0.027	104.00	.55	.13
IRefD	0.0367	0.025	0.0410	0.022	106.50	.62	.11

\*p<.05

Note: IWRAD = Italian Weighted Referential Activity Dictionary; IWRRL= Italian Weighted Reflection and Reorganization List, IRefD = Italian Reflection Dictionary; ISenSD = Italian Sensory-Somatic Dictionary; ISAffD = Italian Dictionary of respectively Sum of Positive, Negative, Neutral Affects; <sup>a</sup>= effect size is given by the rank biserial correlation



**Table 5. Clinical examples of EWI in women with different ART outcome****Participant with positive ART outcome with the highest values in IWRRL in Time 3 writing session**

Time 3: *A lavoro nessuno sa niente di quello che sto passando, solo un paio di persone fidate. Bè l'altro giorno l'ho detto all'ultima persona a cui avrei mai pensato di dirlo, perché è una che chiacchiera molto, spettegola e conosce i cavoli di tutti. Le ho detto tutto ridendo, le ho chiesto di non raccontarlo a nessuno e quando ci penso mi viene da sorridere e mi chiedo "chissà se ce la fa"? Però è stato bello, è stato liberatorio, mi sono svuotata, come se l'avessi detto a tutti...tanto penso che dovrei farlo prima o poi, ho solo paura delle persone cattive solo questo. A volte penso, quando cerco di capire veramente perché affronto tutto questo, se è davvero un figlio quello che voglio o solo l'esperienza della maternità, spesso i bambini dai sei anni in su non è che mi stiano così simpatici. Una mia amica però mi ha detto che i figli propri sono un'altra cosa. Questo ancora non posso capirlo...spero presto, prestissimo....* [Nobody knows anything about what I'm going through at work, just a couple of trusted people. Well, the other day I said the situation I'm facing to the last person I ever thought of saying it, because she is a very chatty, gossip and knows everyone's cabbages. I said it laughing, I asked her not to tell anyone it and when I think about that situation, I smile and I wonder "who knows if she can do it"? But it was nice, it was liberating, I emptied myself, as if I had told my situation to everyone ... I think I should do it sooner or later, I'm just afraid of bad people, just this. Sometimes, when I really try to understand why I face all this, I think about if I really want a child or if I want to live just the experience of motherhood, often I don't like children aged six years and up. But a friend of mine told me that owns children are something else. I still can't understand this ... I hope to do soon, very soon]

**Participant with negative ART outcome with the lowest values in IWRRL in Time 3 writing session**

Time 3: *Ormai manca poco. Speriamo vada tutto bene! Sto un pochino meglio di quando abbiamo iniziato... forse mi sto rassegnando come va va! Spero solo che se il risultato sia negativo riusciamo a riprenderci velocemente. Anche se è difficile pensarlo troveremo un'altra forma di figlio da amare.* [Now there is little missing. We hope that everything will go well! I feel a little better than when we started ... maybe I'm resigning myself, go as it goes! I just hope that if the result is negative, we will be able to recover quickly. Although it is difficult to think of it, we will find another kind of child to love].

**Participant with positive ART outcome with lowest ISensD in Time 3 writing session**

Time 3: *Oggi sono concentrata rispetto all'attesa che ha caratterizzato i 4 anni precedenti, che sta caratterizzando l'oggi ed i prossimi quindici giorni che cercherò di vivere il più tranquillamente possibile, poiché i mesi precedenti e la volta scorsa sono stati un incubo che ho vissuto male sia con me stessa che nel rapporto con gli altri. Essendo una persona abitudinaria e che ha un cattivo rapporto con le novità la volta scorsa non ero al corrente di ciò che mi dovevo attendere. Ora sono già più consapevole e questo sicuramente mi sta aiutando.* [Today I am focused on the expectation that has characterized the last 4 years, which is characterizing today and the next fifteen days that I will try to live as quietly as possible, since the previous months and the last attempts were a nightmare that I lived evil both with myself and in the relationship with others. Being a person of habit and having a bad relationship with news the last time I was not aware of what I had to expect. Now I am already more aware and this is definitely helping me].

**Participant with negative ART outcome with the highest values in ISensD in Time 3 writing session**

Time 3: *Oggi sono preoccupata da morire, visto che le cose non stanno andando come dovrebbero. Ho paura per me e per il mio corpo. Continuo a non vedere luce alla fine del tunnel. Vivo in costante apnea. Il corpo non risponde come dovrebbe. C'è poco da dire, troppe incognite. C'è pure il rischio che debba sospendere qui, dopo tanta fatica. Lo sapevo che non era una passeggiata...ma così delusione dopo delusione. Bisogna avere una forza d'animo che forse non ho.* [I am worried to death today, as things don't go as they should. For myself and for my body, I am afraid. At the end of the tunnel, I still see no sun. I'm going with chronic apnoea. The body does not respond as it ought to. None is to be told, so many unknowns. There is also the possibility that, after too much work, he would have to stop here. I realized that it wasn't a stroll through the park... Yet disappointment after disappointment after that. You need to have a fortitude that I do not have].

Note: IWRRL= Italian Weighted Reflection and Reorganization List; ISensD = Italian Sensory-Somatic Dictionary.