



RESEARCH ARTICLE

THE INTERACTION BETWEEN THOUGHT AND ENVIRONMENTAL STIMULATION:
REVISITING THE THEORY OF THOUGHT WITH IMAGES AND WITHOUT IMAGES

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ARTICLE INFO

Article History:

Received 08th November, 2017

Received in revised form

23rd December, 2017

Accepted 15th January, 2018

Published online 28th February, 2018

Key words:

Thinking in images,
Thought without images,
Thought motivations,
Environmental stimulation,
Consciousness.

ABSTRACT

The present article reports the results of a descriptive-correlational study that tried to return to the theory of thought with images and without images with the objective of exploring the relevance of environmental stimulation in its elicitation. The purpose of this work was to explore whether environmental stimulation influences the forms of symbolic nature of thought (images and without images) or, even if, the iconic nature of thought is independent of environmental stimulation. Fifty university students participated, who were individually subjected to two thought elicitation events: an instrumental music and a story. After each stimulus, a video-assisted qualitative interview was carried out with the objective of monitoring the thoughts of the participants. The categories of thought were codified and analyzed through a descriptive statistical analysis, Z test for the comparison of proportions and a Bayesian analysis (BF). The results show that the nature of the stimulus does not determine the emergence of one type of thinking over another; however, when stratifying by sex, differences appear. It is concluded that the denotative and imaginative thinking fluctuates permanently in the experience, independent of the environmental stimulation. The emergence of a thought in images and without images does not depend on the characteristics of the social and cultural context, but on what these stimuli remove in the individual consciousness, so it is possible to think that thought transits by different forms of expression, according to the interaction between environmental stimulation and the internal motivations of human consciousness.

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Citation: Pablo Fossa, Yerko Molina, Natalia Awad, Fabián Ramos and Sofia de la Puerta. 2018. "The interaction between thought and environmental stimulation: Revisiting the theory of thought with images and without images", *International Journal of Current Research*, 10, (02), 65618-65621.

INTRODUCTION

Since the beginning of the discipline, Oswald Külpe and the School of Würzburg were interested in the experimental study of deep phenomena of consciousness, such as thought. Külpe (1909) was a prominent student Wundt, founded the laboratory of psychology at the University of Würzburg in 1896, which enjoyed equal prestige that Leipzig of Wundt and Munich of Lipps. Külpe had great influence in rethinking the introspective method in psychology, discarding by applying experimental methods in the study of thought, an object that had been treated until then by psychologists and philosophers without the rigor and methodology used by Külpe (1909). Through his laboratory procedures, Külpe came to pose the theory of thought with images and without images (Ogden, 2011). Külpe (1909) succeeded in replacing the study of the physiological phenomena carried out by Wundt (1886) - in which an attempt was made to explore physical phenomena

correlated with psychic facts - by the application of introspection to the experimental method. He presented introspection as a means of investigation and showed that the study of higher psychic processes is possible in an empirical way. For Külpe (1909) the method of introspection constitutes the main instrument for the study of human nature; without it, psychology would be purely physiological, and in it only the isolated structures and functions of consciousness would be studied. Because of this, Külpe (1909) proposes that introspection has to become a true scientific instrument; that is, from his perspective, introspection must be systematic and controlled. Külpe (1909) succeeded in replacing the study of the physiological phenomena carried out by Wundt (1886) - in which an attempt was made to explore physical phenomena correlated with psychic facts - by the application of introspection to the experimental method. He presented introspection as a means of investigation and showed that the study of higher psychic processes is possible in an empirical way. For Külpe (1909) the method of introspection constitutes the main instrument for the study of human nature; without it, psychology would be purely physiological, and in it only the isolated structures and functions of consciousness would be studied.

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Because of this, Külpe (1909) proposes that introspection has to become a true scientific instrument; that is, from his perspective, introspection must be systematic and controlled. The Würzburg group did not accept the elemental, reductionist and associationist position of the Leipzig School with which cognitive processes were studied, nor did they agree with Wundt that thought could not be studied through introspection (Mora, 2007). Some of the criteria that, according to Danziger (1980), allow to differentiate the experimental introspection, as practiced by Wundt, from the phenomenological introspection of Külpe, are that phenomenological introspection is more permissive than the experimental introspection of Wundt with respect to the retrospect. The School of Würzburg admitted the retrospective method as a complement in the study of mental processes (Danziger, 1980). On the other hand, phenomenological introspection shows interest in data of a subjective nature, unlike Wundt, who worked mainly with objective data such as reaction time, the number of errors committed when remembering, the measurement of physiological indices, etc. From Danziger's perspective: "subjects also described complex decision processes that clearly involved the effects of expectation and suggestion, as well as individual differences" (Danziger, 1980, p 251). In the phenomenological introspection of Külpe the researcher has a prominent role, since during the experiment he actively asks questions in an attempt to help the subject to provide information about what was going on in his mind during the resolution of a problem (Danziger, 1980), while in experimental introspection the experimenter played a modest role (presented stimuli and recorded responses). In contemporary psychology, it is Vygotsky (1934) and Piaget (1922) who systematize the study of thought. For Vygotsky (1934) thought needs symbolic mediation for its expression; Therefore, by intercepting the deepest motivations of thought with the internalized social language, the already classical Vygotskian denomination of verbal thought would be formed. Much of the current research has followed a mainly Vygotskian orientation to address the study of thought, that is, assuming only one thought in words. On the other hand, since the contribution of Vygotsky (1934) to the study of thought has been assumed trajectories, transitions and fluctuations of thought, both in form and content, as a product of environmental influence and its entanglement with the stimulation of the immediate context of the individual. That is, the emergence of symbolic forms of thought is not independent of internal motivations and environmental stimulation; However, the current literature has evidenced different forms and functions of thought, in which the descriptions of Külpe and Vygotsky are evident (Fossa, Awad, Ramos, Molina, De la Puerta and Cornejo, in press).

From this perspective, then, in this work we try to return to the theory of thought with images and without images with the aim of exploring the relevance of environmental stimulation in its elicitation. The objective that was tried to reach in this work was to explore if the environmental stimulation, translated in specific stimuli, has influence on the forms of symbolic nature of the thought (images and without images) or, although, the iconic nature of the thought is independent of the environmental stimulation.

METHODS

A quantitative, non - experimental, cross - sectional study was carried out with a descriptive - correlational design, with the main purpose of evaluating the association between thought

forms and environmental stimulation. Participants were 50 university students, 16 men and 34 women, whose ages ranged between 18 and 24 years, who were invited to a laboratory procedure. All participants signed an informed consent, in which they declare their voluntary participation in the study and be recorded for research purposes through high definition digital cameras. The procedure consisted of two phases. At first, the participants were asked to listen to an instrumental music, in the absence of the researcher. The piece selected for the study was the classical composition *The Unanswered Question* by Charles Ives. This piece was selected because it belongs to a musical genre not completely known to the participants and presents variations between segments of soft and slow sounds mixed with sudden irruptions of wind instruments, which could elicit greater variability in the forms of thought.

The second phase of the procedure consisted of inviting the participants to read a story which was projected on a monitor inside the laboratory. The selected story was *Blood Pact* by Mario Benedetti. This story is about the story of a grandfather and his grandson, who enjoyed their friendship until the grandson is taken "cheated" to another city by his parents, in search of a better education. The grandfather does not resist this situation because the last years of his life have no meaning. The stimuli chosen for both phases of the study - musical piece and short story - were aimed at eliciting different ways of thinking in the participants, because one of them consisted of an auditory stimulus and another a visual and verbal stimulus. The criteria for selecting these stimuli were based on their introspective character and their temporal extension, characteristics that allowed the participants to enter a favorable state for dialogue with themselves.

At the end of the reflection of each of the phases of the procedure, a collaborator entered the laboratory to perform a video-assisted qualitative interview (Halford and Sanders, 1990, Waldron and Cegala, 1992). The video-assisted interview has been used in empirical works for the study of different cognitive processes in order to show the flow of thought retrospectively, following the tradition of the experiments of Külpe (1909). The studies that make use of the video-assisted interview involve the completion of a specific task and then the interview is performed, in which previously experienced thoughts and feelings are relived while watching the reproduction of the video of the previously performed procedure. A researcher from the team interviewed each participant by reviewing the videotape in each of the stimuli. The purpose of this interview was to investigate imaginative and non-imaginative thoughts in the participants. The duration of the interviews was approximately 10 minutes, in which the participant and the researcher reviewed the video record together. The procedure of the present study incorporates the participant as part of the analysis. That is, it is the participant who, observing himself in the video, recounts the internal thoughts, assuming that it is the participant who can reconstruct the flow of his thought. An encoding of thought forms was done at the level of time frames of 10 seconds, on each procedure. The data collection consisted of editing the video records, coding categories of thought in each moment of the video according to the following description:

Denotative Thinking (without images): Form of conceptual and declarative thinking whose objective is to transmit information (e.g. "At that time I was thinking about whether the main character had been a war veteran or not...").

Thought in Images: Form of thought in which images or scenes are described, that give account of the capacity of imagination (e.g. "At that moment I imagined a forest with water running by a river...").

Expressive Thought: A global and diffuse form of thought, with spherical contents, with high affectivity and which alludes to organismic sensations (e.g. "At that moment something sublime, floating like a feeling of oceanity came to my mind"). This type of thinking does not correspond to the denotative type, because it does not constitute thought in words. A recent study has associated this form of contemplative thinking with the presence of mental images (Fossa, et al, in press), which is why this work has been considered as a form of thought in images. For the registration of the data, two judges were trained to identify both categories. The judges coded all the segmented records in small frames of 10 seconds of time registering the categories in a dichotomous way (1 = appears and 0 does not appear). To assess the reliability from the interexamination congruence criterion, a multivariate kappa statistic was calculated, which resulted in 0.89, showing a high level of agreement among the examiners. Regarding the data analysis, the result of the registration of the information was specified in a database, in which the dichotomically coded categories (n = 1,709) were recorded for each 10-second frame, analyzed for each subject of the study according to each phase (Phase A = musical piece, Phase B = story reading).

First, a comparison of proportions through the Z test for each of the units of denotative, expressive and imaginative thought, corresponding to the verbal and iconic categories according to each phase situation, was made. Subsequently, a Bayesian analysis -Bayes Factor- was carried out to analyze the robustness of the evidence for the null or alternative hypothesis, through the JASP program.

RESULTS

Below, the main results of the study are presented. First, the proportions and confidence intervals for each of the units of denotative, expressive and imaginative thought, corresponding to the verbal and iconic categories according to each phase situation, are presented. Then comparisons are presented according to phase using z-test to compare proportions with their corresponding p value and the BayesFactor to analyze the robustness of the evidence for the null or alternative hypothesis. It is observed in the table that for IMAGINATION no statistically significant differences are observed between the experimental situations ($Z = 1,002$, $p = 0,316$). It is also observed that the evidence in favor of the H_0 (that is, there are no differences) is considered robust if the Bayes factor is observed, which reaches a value of 0.090 (<0.1). Regarding DENOTATIVE it can be observed that no statistically significant differences were found between the experimental situations ($Z = 1.002$, $p = 0.316$); however, the Bayes factor

Table 1. General descriptive analysis

	PHASE	N	P	IC 95%	Z	P value	BF
IMAGINATION	A	924	0,1115	[0,091 – 0,132]	1,002	0,316	0,090
	B	778	0,1272	[0,104 – 0,151]			
DENOTATIVE	A	924	0,337	[0,306 – 0,367]	1,884	0,06	0,317
	B	778	0,381	[0,346 – 0,415]			
EXPRESSIVE	A	924	0,052	[0,038 – 0,066]	-0,868	0,385	0,079
	B	778	0,0617	[0,045 – 0,079]			

Table 2. Contingency analysis

TYPE	PHASE	PRESENCE	ABSENCE	CHI Test	BF
IMAGINATION	A	103 (11,1%)	821 (88,9%)	X = 1,005	0,065
	B	99 (12,7%)	679 (87,3%)	P = 0,316	
DENOTATIVE	A	311 (33,7%)	613 (66,3%)	X = 3,545	0,343
	B	296 (38,0%)	482 (62,0%)	P = 0,06	
EXPRESSIVE	A	48 (5,2%)	876 (94,8%)	X = 0,754	0,041
	B	48 (6,2%)	730 (93,8%)	P = 0,385	

Table 3. Contingency analysis in women

TYPE	PHASE	PRESENCE	ABSENCE	CHI Test	BF
IMAGINATION	A	77 (11,8%)	573 (88,2%)	X = 3,235	0,249
	B	84 (15,4%)	461 (84,6%)	P = 0,072	
DENOTATIVE	A	184 (28,3%)	466 (71,7%)	X = 12,60	36,53
	B	207 (38,0%)	338 (62,0%)	P < 0,001	
EXPRESSIVE	A	44 (6,8%)	606 (93,2%)	X = 0	0,037
	B	37 (6,8%)	508 (93,2%)	P = 1	

Table 4. Contingency analysis in men

TYPE	PHASE	PRESENCE	ABSENCE	CHI Test	BF
IMAGINATION	A	26 (9,5%)	248 (90,5%)	X = 1,577	0,131
	B	15 (6,4%)	218 (93,6%)	P = 0,2019	
DENOTATIVE	A	127 (46,4%)	147 (53,6%)	X = 3,423	0,606
	B	89 (38,2%)	144 (61,8%)	P = 0,064	
EXPRESSIVE	A	4 (1,5%)	270 (98,5%)	X = 4,665	1,370
	B	11 (4,7%)	222 (95,3%)	P = 0,031	

indicates that the evidence in favor of the null hypothesis is moderate. Regarding the EXPRESSIVE variable, as in the other comparisons, no statistically significant differences were found between the experimental situations ($z = -0.868$, $p = 0.385$). If the Bayes factor is observed, it can be concluded that the evidence in favor of the H0 is robust ($BF = 0.079 < 0.1$).

In the case of contingency analysis, it can be observed that none of the types of expression was related to the phase. In the case of IMAGINATION and EXPRESSIVE, the evidence in favor of H0 is strong ($BF = 0.065$, $BF = 0.041$, respectively). Regarding DENOTATIVE, the evidence in favor of H0 is considered moderate with a Bayes factor of 0.343. In the case of contingency tables according to sex, in the case of women it can be observed that of the types of expression the only DENOTATIVE thought was related ($x = 12.6$, $p < 0.001$), showing a high level of evidence in favor of the alternative hypothesis ($BF = 36.53; > 10$). Phase A of the procedure has a lower occurrence of this type of expression than phase B. In the case of IMAGINATION, the evidence in favor of H0 is moderate ($BF = 0.249$), whereas for EXPRESSIVE the evidence in favor of H0 is strong ($BF = 0.037$). In the case of contingency analysis in men, it can be observed that of the types of expression was related to the EXPRESSIVE phase only ($X = 4.665$, $p = 0.031$); however, the level of evidence for H1 is anecdotal ($BF = 1.370$). In the case of imagination, the evidence in favor of the H0 is strong ($BF = 0.131$) whereas for the denotative it is anecdotal ($BF = 0.606$).

DISCUSSION

The results of this study show that the nature of the stimulus does not determine the emergence of one type of thinking over another. The thought fluctuates between its different symbolic natures, it is even possible to think that, to a great extent, thought condenses an integrated process between iconic symbols and verbal symbols during the flow of psychological experience. Despite these findings, differences are evidenced when a stratification by sex is performed. In women, phase B causes a greater denotative response than phase A. On the other hand, in men, phase B showed a greater expressive response than phase A. This finding could be possible due to the characteristics of the stimuli presented. In stage B of the procedure, a verbal stimulus -speak- with a high level of emotion was presented. In this phase the great majority of the thoughts referred by the participants had a character of memories. On the other hand, when presenting the stimulus a specific topic, could have addressed thoughts related to that particular topic, so the variability of responses in this phase of the procedure could have been less. In phase A, on the other hand, the nature of the stimulus-instrumental music-did not present a specific theme, so that variability of thoughts was greater, being referred on several occasions thoughts of imagination in the future. These findings could make us think that, although it is not evident that the nature of the stimulus generates specific thought forms (in images or without images), if it could be shown that men and women have different ways of expressing thought. This, without a doubt, should be the subject of research in future academic work in this line.

In summary, from the findings of this work it is possible to conclude that denotative and imaginative thinking fluctuates permanently in experience, independent of environmental stimulation. Apparently the emergence of a thought in images and without images, does not depend on the characteristics of the social and cultural context, but on what those stimuli remove in the individual consciousness; namely, memories, emotions, anecdotes, problems or future planning. This study provides empirical evidence in favor of the thesis of Külpe (1909) regarding the existence of a thought in images and without images; However, this work has shown the difficulty of empirically capturing the thought, since it transits automatically by different forms of expression, according to the interaction between environmental stimulation and internal motivations (Fossa, 2017). This allows us to understand that the flow of thought and its trajectories depend on the clash of opposing forces, impossible to predict. That is, from the social and cultural world - environmental stimulation - to consciousness and the deepest motivations of consciousness - the motives of thought - towards the social and cultural world. Future studies should continue the deepening of the encounter between human consciousness and culture to understand and provide more evidence about the iconic and denotative forms of thought.

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