

Linguistic Phenomena in Men and Women - TOT, FOK, Verbal Fluency

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Abstract—The aim of this study is to describe the differences between women and men in the phenomena of feeling of knowing/know (FOK), tip of the tongue (TOT), and verbal fluency. Two studies are presented. The first included a group of 60 participants and focused on the analysis of FOK and TOT in men and women. The second study described the performance of 302 participants in verbal fluency tasks. Both studies showed that sex is not a significant predictor of linguistic abilities. Rather, the main factors influencing one's linguistic ability were Vocabulary and education. This study enriches the knowledge on mechanisms of memory and verbal production.

Keywords—Feeling of knowing, Tip of the tongue, Verbal fluency, Sex differences.

I. INTRODUCTION

DIFFERENCES in linguistic abilities between men and women are still being discussed. There are lots of studies which confirm the sex differences in verbal abilities. Various studies show for instance that men receive better results in tests of mental rotation, spatial perception, mathematical problem solving, and spatial navigation than women [1]. Women are presented to score better in some linguistic aspects such as phonological and semantic fluency, or grammatical correctness [1]. Women's performance is also seen to be better in episodic memory tasks, especially in autobiographical memory when the tasks concern words, stories, pictures of objects, pictures of faces, and smells [2]. Women are shown to remember better the called information. According to some research, women display the elaborated semantic system [3].

We are interested in the phenomena of feeling of knowing (FOK), tip of the tongue (TOT), as well as verbal fluency in men and women. FOK is experienced as feeling of knowing the information without the possibility of recalling it (at a specific moment). FOK is different from *remembering/recalling*. The latter means an immediate good answer. FOK can be explained by two hypotheses. According to the *hypothesis of trace-access*, the direct-access monitoring of memory exists, and therefore a feeling of "knowing" or "I do not know" /manifests [4], [5]. The hypothesis called *accessibility model* explains that people do not possess the ability to monitor their memory directly, but could have access to parts of the information or to some cues, i.e. context of information.

Another explanation emphasizes the possibility to start an inferential process because of a lack of monitoring of memory. A hypothesis called *familiarity of the cue* underlies using a lot of cues by people. In effect FOK is caused by the quick evaluation of cues used in recognizing a good target item. According to Koriat and Levy-Sadot [6], all cues could be correct or wrong, and may participate in FOK. All cues lead to correct or wrong answers. The phenomenon of FOK could be explained also by using heuristic procedures; people make use of quantity, types and intensity of information recalled and then people produce some answers [4].

TOT is described as the lack of an individual's capacity to recall a word and at the same time having a feeling of knowing that very word; people feel that a word is in their memory, perhaps that it is just out of reach, and that in a moment it will be recalled [7]. Persons who feel TOT can recall some words but they know that some of these words are incorrect. The TOT phenomenon has fascinated psychologists since the end of the 19th century, when William James provided the first description of this state. Most often TOT appears in situations of recall of names, geographical names, abstract words, usually nouns, rarely verbs and adjectives, and words of low frequency [7]. People feeling TOT enumerate different features of a correct word, mostly phonological features i.e. the first letter, the last letter, the number of syllables, rhyme, similar words, but rarely semantic features such as words with similar meaning. Scientists aim to explain TOT by presenting and investigating different hypothesis. According to James and Burke theory each word has a representation on three levels: visual, semantic and phonological representations [8]. The center of lexical representation is situated between the phonological and semantic levels, which gives rise to the possibility to create a larger context for a word. The state of TOT could be due to a failure in retrieving the lexeme (phonological and morphological features) after a successful selection of the semantic features, or as partial activation of phonological and semantic features, or partial activation only phonological features [9].

The mechanisms of FOK and TOT are still discussed in the literature. TOT concerns declarative memory, mostly episodic memory. FOK is more general, it concerns non-declarative memory. The analysis of FOK and TOT led to the understanding of the relationship between conscious and non-conscious cognition [10], metacognitive processes and their kind of consciousness, and their neurobiological base [11]. They allow for the analysis of the mechanism of memory impairments in healthy participants [12], and deficits of

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memory and metacognitive processes in clinical groups (for example: in patients with dementia Alzheimer's type; schizophrenia; amnesia; patients with lesions to frontal cortex) [13], [14].

Verbal fluency is the ability to produce words. It is used as a kind of psychological test in which a participant has to say as many words as possible from a given category in a given time. Verbal fluency tasks provide an indirect measure of executive functions, semantic memory, as well as semantic distance between the item generated. It is useful at uncovering the structure of semantic memory. Typical indicators of verbal fluency are: number of correct words (appropriate for a criterion), number of phonemic clusters (at least two words stated sequentially starting with the same syllable), number of semantic clusters (at least two words stated sequentially that could be included in the same semantic subcategory), number of phonemic switches (changes between phonemic clusters and between phonemic clusters and words), number of semantic switches (between semantic clusters and words) [15].

The basis of sex differences is due hypothetically to the discrepancies in macro and microscopic structure and activity of structures of central neural system (CSN). Meta-analyses do not present the sex differences in the structure and hemispheric asymmetry of the brain [16]. The found differences in the research could be due to type of task-specificity (words, music, pictures), modality, type of task (recognition, free recall), age and estradiol and testosterone levels hormone [17], degree of dominance of hand [18], sexual orientation [19]. Therefore the relations between behavioral results concerning sex differences and results of neuroimaging techniques require further study [20].

Hypothesis

The main aim of our study is to test the differences between men and women in TOT and FOK, as well as in verbal fluency. The research of Larsson et al. [3] conducted with the *Remember* and *Know Paradigm* showed women better remembered verbal information than men. There were no differences in FOK with respect to correct and incorrect answers between women and men. The authors concluded that perceptual processing based on FOK were similar in both women and men. Other data show that women had higher frontal activation and cingulate gyrus during the tasks connected to episodic memory [2]. These areas control the executive functions (decision and control processes). Higher activation could be associated with more complex and effective mechanisms of recall for the information.

II. METHOD

A. Participants

In the first study, participants were recruited from a group of students; 30 white right-handed heterosexual women and 30 white right-handed heterosexual men. They did not display any psychiatric, neurological or somatic diseases. They were neither addicted to drugs nor to alcohol. They were aged on 21 – 24 years (women: $M = 22.4$ $SD = 0.96$; men: $M = 22.50$ $SD =$

0.82). Women did not differ from men in age ($t = 0.432$ $p = 0.67$). Women did not differ from men in number of years of education (women: $M = 16.03$ $SD = 0.76$; men: $M = 16.07$ $SD = 0.82$; $t = 0.162$ $p = 0.872$).

In the second study, a group of 302 participants (aged: 18-70) without brain pathology was examined (white, right-handed, heterosexual adults, randomly selected, without psychiatric, neurological or somatic impairments, not addicted, (participants completed a questionnaire). All participants performed the semantic verbal fluency task *Animals*.

B. Measures

The procedure of assessment of FOK, TOT was derived from experiments described in literature [21], [14].

The participants have to say a word (noun) related to presented definition. If they have a problem with correct answer they were asked to explain if they had a feeling of knowing an answer (FOK) or if they know an answer and they have an answer on "top of tongue" (TOT). 20 definitions were used and 20 answers were expected. Ten from 20 definitions concerned the nouns of low level of difficulty (high frequency, as health, history, action). The next 10 definitions concerned the nouns of low frequency in spoken language such as manipulation, compromise. The definitions were selected by competent judges from the dictionary. The definitions were tested in the pilot study. After the definitions had been presented the answers were recorded. Five type of answers were recorded: Remember Positive (correct answer), Remember Negative (incorrect answer), TOT ("I have an answer on top of tongue"), I do not know, FOK (I have a feeling of knowing). When a participant gives an answer on TOT he makes the post TOT recognition task. He should indicate which word he had on the top of tongue, and he should choose from 3 words (target item, antonymous, word semantically associated with target item), and he should tell if it is correct answer. The negative (incorrect) TOT (TOT wrong answer) have not been analyzed because all responses after TOT feeling were correct.

The assessment of verbal fluency was derived from studies on verbal fluency described in the literature [15]. All participants were asked to name as many words in a minute as possible from the category of *Animals*. All responses were recorded by the experimenter. The following indicators have been used in the analysis: number of correct words (appropriate for a criterion), number of phonemic clusters (at least two words stated sequentially starting with the same syllable), number of phonemic switches (changes between phonemic clusters and between phonemic clusters and words), number of semantic clusters (at least two words stated sequentially that could be included in the same semantic subcategory), number of semantic switches (changes between semantic clusters and between clusters and words).

C. Results

A U Mann-Whitney test was used to test the differences between men and women in TOT and FOK. Women less

frequently declared TOT ($z=2.10$, $p<.05$). Women declared TOT twice per 20 definitions while men did so three times. There were also the differences between men and women in the number of answers "I do not know" ($z=2.05$, $p<.05$). Women more frequently said that they did not know the answer. Men more frequently declared FOK (feeling of knowing) ($z=2.32$, $p<.05$). There were no significant differences between men and women in number of correct and incorrect answers.

It is difficult to say whether the differences in TOT and FOK between men and women were due to sex because we did not control of the intellectual level of participants. This important factor was included in the subsequent part of the analysis, on sex differences in verbal fluency. The test of vocabulary (Vocabulary subscale from WAIS-R; [22]) to determine whether men and women differed in verbal intelligence was used. Men and women did not differ in vocabulary (women $M=44.58$, $SD=12.95$, men $M=45.30$, $SD=13.21$, $F(1,198) = 0.14$). A multiple regression analysis was conducted to test whether the results in verbal fluency were related to sex, age, educational level, and Vocabulary. The dependant variables were the number of correct words, the number of phonemic clusters, the number of phonemic switches, the number of semantic clusters, the number of semantic switches. The predictors were sex, age, education (in years), and Vocabulary.

TABLE I

MULTIPLE REGRESSION ANALYSIS, CATEGORY ANIMALS ($N=302$)

Predictors	CW	PC	PS	SC	SS
Vocabulary	.31***	.14*	.29***	.31***	.15**
Sex	.02	.04	.06	.08	-.05
Age	-.07	-.06	-.06	.08	-.19***
Education	.26***	-.06	.25***	.05	.21***
R	.50	.13	.48	.36	.37
R^2	.25	.02	.23	.13	.14
$F_{(4,297)}$	25.18***	1.38	22.59***	11.14***	12.41***

Note: *-. $p < .05$ ^ $p < .01$, *** $p < .001$

CW = correct words, PC = phonemic clusters, PS = phonemic switches, SC = semantic clusters, SS = semantic switches

Two variables (vocabulary and education) explained 25% of the variance in the use of the correct words in category Animals. Sex was not significant in any indicators. Vocabulary correlated with the number of phonemic clusters in the category Animals. Vocabulary and education accounted for 23% of the variance in phonemic switches. Vocabulary explains 13% of the variance in the use of semantic clusters. Three variables (vocabulary, education and age) were the significant predictors for the number of semantic switches in Animals category. A model of regression explained 14 % of the variance in creating of semantic switches, but sex was not a significant predictor for the number of semantic switches in the Animals category.

III. DISCUSSION

Less frequent TOT in women may be a symptom of better organized representation of words (notions), or more numerous connections between notions. That is why women have the possibility to quicker recall the words from semantic memory. Men may have another structure of notions, or the connections between them are not numerous. There were no differences in the correct (Remember Positive) and incorrect answers (Remember Negative) between men and women, but found in TOT and FOK. It shows that the differences in men and women do not refer to vocabulary or semantic system, but to the different mechanism of recalling the information. Women may have better ability to verbalize their cognitive state. They may also have better control of their recalling process. The results on verbal fluency are coherent with the findings on TOT and FOK. They show that sex is not a significant predictor for semantic verbal fluency task, so women and men possess similar linguistic abilities in naming the words women and men in the recalling strategies. The presented results are consistent with the statement in review that sex differences in verbal fluency are not identified [23]. An exception is the affective tasks [24]. These last findings need to be verified in the future studies.

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