Impact of Unconscious Emotional Schemata on Verbal Fluency – Sex Differences and Neural Mechanisms

Barbara Gawda and Ewa Szepietowska

ABSTRACT
Many factors such as intelligence, age, education, and sex may have an important influence on verbal fluency according to literature. The aim of this study is to examine the possible impact of the emotional schemata associated with sex differences on verbal fluency performances. Four tasks of verbal fluency were used in this study: two tasks of semantic verbal fluency (Animals, Vehicles) and two tasks of affective verbal fluency (Pleasant-Joy, Unpleasant-Fear). The results were analysed for 302 adults aged 18 to 70 years old. The number of correctly enumerated words, the number of phonemic clusters, the number of semantic clusters, and the number of phonemic and semantic switches were recorded. The results confirmed data that sex explains a little variance of results in verbal fluency performance; sex is not a predictor of semantic verbal fluency, but a significant predictor for emotional verbal fluency. Significant differences in verbal fluency between men and women were found only in emotional tasks. The hypothesis about the unconscious emotional schemata and linguistic fluency associated with sex differences was formulated.

Key Words: emotional schemata, verbal fluency, neural mechanisms, sex differences

1. Introduction
Verbal fluency is an ability to produce words. It is also a kind of psychological tests in which a participant has to say as many words as possible from category in a given time. Verbal fluency tasks provide an indirect measure of semantic distance between the items generated. It is useful at uncovering the structure of semantic memory (Tabert et al., 2001). Main factors which have an impact on verbal fluency performance are vocabulary, age, sex, education, emotional and personality traits as well as affective states. The review of data related to sex differences in verbal fluency showed that these data are mixed. For example, Heister (1982) reported women score better in phonemic fluency than men. But she did not find differences in semantic verbal fluency (she asked participants to name the red and round things). Heister (1982) argued that women are able to recall the information from memory faster than men, but she did not find support for the hypothesis about women’s richer vocabulary. Similar findings that women are better in verbal recall tasks (especially in recall of real words) were published by Kimura and Clarke (2002), and Kimura and Seal (2003). The research...
presented by Weiss et al. (2003) showed that women had better results in phonemic verbal fluency, and no significant differences were seen in semantic verbal fluency tasks. Those results are difficult to interpret, because the Weiss’s (et al., 2003) study had significant limitations; the groups of men and women were not balanced in age, and verbal intelligence. Sex as a separate variable was found as to explain little variance of results in verbal fluency. That is why many researchers suggested that the studies on verbal fluency need to include more factors than sex. These factors may be age, education, or verbal intelligence. In general, age decreases the number of words and switches. However, the interaction between age and sex may have considerable influence on verbal fluency performance (Capitani et al., 1998). For example, Brickman et al., (2005) stated that men have worse scores in phonemic verbal fluency with increasing age, whereas women execute verbal phonemic fluency tasks at a similar level independent of their age. Another interesting result is that men’s scores on semantic fluency tasks are independent of age (Tombaugh et al., 1999). Influence of education on verbal fluency performance is opposite to age’s influence; education increases the number of switches and words. Evidence that the data on verbal fluency are mixed can be found in another study which showed that women had worse results on phonemic verbal fluency than men, and that their results tended to decrease with age (Dursun et al., 2002). To the contrary, another result showed the lack of evidence for the interaction between age and sex for phonemic and semantic verbal fluency (Crossley et al., 1997).

The type of tasks may be another important factor which may have a possible impact on verbal fluency performance. The possible types of the tasks of verbal fluency are phonemic (letters A, B, K), semantic (Animals, Fruits, Vehicles), affective (Pleasant, Joy, Love, Unpleasant, Hate, Fear), neutral (Fruits, Vehicles), animate (Animals), or inanimate (Vehicles). In sum, the findings on neutral verbal (phonemic and semantic) fluency are mixed (Brickman et al., 2005, Dursun et al., 2002, Weiss et al., 2003). Sex differences may concern the affective, but not the neutral tasks. This is based on some data which suggests that affective and neutral tasks of verbal fluency differ in men and women; significant differences have been found in the use of emotional words between men and women, where men used emotional words less frequently than women (Cohen, 2009). There are also studies on affective language in men and women which support the current hypothesis; the content and form of emotional expression differ in men and women (Gawda, 2008; 2012). This is why the affective verbal fluency tasks positive “Pleasant – Joy”, and negative “Unpleasant – Fear” was introduced in the present study. We suppose that affective verbal fluency refers to affective schemata, because verbal fluency tasks are useful at uncovering the structure of semantic memory. This hypothesis is based on the previous data related to affective language, affective knowledge in men and women, and women’s emotional schemata (Gawda, 2008, 2012; Mulac et al., 1990).

The emotional schemata were described in cognitive theory; they are the frameworks responsible for the interpretation of events. Their affective-cognitive construction is stable and they create the basis of strategies of functioning (Beck et al., 2004). The maladaptive schemata are constructed because of dysfunctional cognitive processing such as false logic, false generalization, and inappropriate selective attention (Clark and Fairburn 1997). The cognitive processing supports the disorder and false beliefs (Gelder, 1997). The procedure of supporting includes attention, memory and imagination, and refers to the different levels of consciousness (Rachman, 1997; Gelder, 1997). The idea of the interactive subsystems of cognitive processing explains how a multilevel system organizes the dysfunctional behavior (Teasdale, 1997). Sternberg (1998) described emotional schemata as the cognitive representations reflecting the information about the events with people’s roles in these events, their behavior and emotions. These mental representations are individualized and marked by personal emotional climate (Sternberg, 1998). Berne (1972) stated that interpersonal communication and behavior is determined by emotional schemata. They are the forms of structuring the experience containing the significant emotional components. That is why their impact on behaviour may be significant. They may organize spontaneous human behaviour, plans, goals, dreams, etc. These schemata may be expressed in spontaneous language (such as in verbal fluency), because
they are automatic and unconscious. Discussion on the neural basis of unconscious and emotional processing may point to the important information explaining the mechanisms of emotional language and encoding of emotional experience in language. Brain activation correlated with emotions refers to a large network of structures (Canli et al., 2002). The right hemispheric limbic structures are believed to be dominant in emotion driven decision-making (Trimble, 2007). The areas activated with emotional experience include amygdala, the bilateral superior frontal gyrus, and right middle, and bilateral inferior frontal gyri, left-lateralized anterior cingulate, right precentral gyrus, left thalamus, and left insula. This network is associated with attention, language, and motor control (Canli et al., 2002). The left hemisphere is involved in controlled articulation, symbolic and abstract processes (Banich, 2004). In general, the right hemisphere has been described as the “unconscious knowledge” and it allows to understand the subtle nuances of language, and prosody of language (Cattell, 2006). There some data which show that men and women activate different neural circuits to encode emotional stimuli. For example, women have more activation in the left than in the right hemisphere, whereas men show no hemispheric asymmetry (Canli et al., 2002). That is why the hypothetical sex differences in verbal emotional fluency performance may be explained by the differences in neural mechanisms in men and women.

2. Material and methods

2.2. Participants

The participants included 302 white, right-handed, heterosexual adults, randomly selected (138 women and 164 men). All participants were healthy; they did not display any psychiatric, neurological or somatic impairments, were neither addicted to drugs nor to alcohol (participants completed a questionnaire to determine relevant characteristics such as sex, education, age, and somatic or psychiatric problems). They were aged 18-70 years (women: M = 32.26 SD =12.56; men: M = 31.27 SD = 12.91). Women did not differ from men in age (F(1,300) = .45 ns), not in years of education (women: M = 14.02, SD = 2.81, men: M = 13.15, SD = 2.51). All participants were native Polish speakers.

2.3. Procedure and measures

The assessment procedure on verbal fluency was derived from the typical studies described in the literature (Tabert et al., 2001). The participants’ fluency was tested by four tasks in two categories: semantic verbal fluency and affective verbal fluency. The participants were asked to name as many words in a minute as possible from the specific categories of: Animals; Vehicles [semantic fluency]; and Pleasant-Joy and Unpleasant-Fear [affective fluency, every word named by participants as Joy/Fear was treated as meeting a criterion, this category is particularly subjective, and only perseverations were treated as incorrect]. The experimenter recorded all verbal responses; the identified words were counted for every participant and task. Then, a test of vocabulary was used (Vocabulary subscale from WAIS-R; Brzeziński et al., 2004) to determine whether men and women differed in verbal intelligence. Men and women did not differ in vocabulary (women: M =38.44, SD=12.62, men M=35.82, SD=11.89, F(1,300) = .74, ns). This result showed that the hypothetical discrepancies in verbal fluency may be not due to the verbal intelligence of the participants. Moreover, two measures of affective mood and affective traits were used: the STAI by Spielberger, and the PANAS Scale by Watson and Clark (1994). The Polish version of the State Trait Anxiety Inventory (STA1; Wrześniewski et al., 2002) was used in this study to test the emotional differences in men and women. Significant differences were found in the trait anxiety scores between men and women (women: M=42.44, SD=9.79, men: M = 40.16, SD = 10.00) F(1,300) = 3.95, p<.05). Women displayed higher anxiety trait that is why the Anxiety Trait Scale was included in the subsequent analysis. The significant differences were also found in Negative Trait and Positive State measured by PANAS. Women had higher Negative Affect Trait than men (women: M=30.33, SD=10.07, men: M = 27.44, SD = 10.01) F(1,300) = 6.16, p<.01, while men had higher Positive Affect State than women (women: M=43.41, SD=8.78, men: M = 45.78, SD = 9.12) F(1,300) = 5.21, p<.05).

The typical indicators of verbal fluency used for each type of task in the analysis may be: number of correct words appropriate for a criterion, number of errors (perseverations, incorrect words, stuttering), number of phonemic clusters, number of semantic
clusters (at least two words stated sequentially that could be included in the same semantic subcategory, a semantic cluster could also be the name of a category and an example of the category), number of phonemic switches, number of semantic switches (Tabert et al., 2001). We used all above mentioned indicators with exception the number of errors.

3. Results and discussion

3.1. Results

The differences between women and men have been found in verbal fluency in the category Pleasant-Joy, and in the category Unpleasant-Fear. Women named more correct words, and created more phonemic and semantic switches in the category Joy than men did. Women named more correct words and created more semantic clusters, semantic switches as well as phonemic switches than men in the category Unpleasant-Fear. No more significant differences have been found between verbal fluency tasks among men and women. No significant difference between women and men was found in the category Vehicles. There were no significant differences between women and men in the category Animals (Table 1).

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Women (n=138) M (SD)</th>
<th>Men (n=164) M (SD)</th>
<th>F_{(1,300)}</th>
</tr>
</thead>
<tbody>
<tr>
<td>Correct words</td>
<td>21.33 (5.97)</td>
<td>20.76 (5.43)</td>
<td>.74 ns</td>
</tr>
<tr>
<td>Phonemic clusters</td>
<td>.02 (.18)</td>
<td>.04 (.27)</td>
<td>.55 ns</td>
</tr>
<tr>
<td>Phonemic switches</td>
<td>20.43 (6.03)</td>
<td>19.59 (5.51)</td>
<td>1.60 ns</td>
</tr>
<tr>
<td>Semantic clusters</td>
<td>2.85 (1.28)</td>
<td>2.78 (1.24)</td>
<td>.22 ns</td>
</tr>
<tr>
<td>Semantic switches</td>
<td>10.98 (4.35)</td>
<td>10.17 (4.21)</td>
<td>2.71 ns</td>
</tr>
</tbody>
</table>

Table 1. Descriptive statistics for semantic verbal fluency by sex (category Animals) (N = 302). M – mean value, SD – standard deviation, ns - non-significant.

The significant differences in affectivity were mentioned (description of participants); women displayed higher anxiety trait, higher negative affect trait, and men higher positive affect state. Therefore, a multiple regression analysis was conducted to explain whether the results in affective tasks were related to affective characteristics (anxiety trait, negative affect trait, positive affect state), or sex, age and educational level. We excluded from a regression model verbal intelligence tested by Vocabulary Scale from WAIS-R because this variable explains a majority of variance of each verbal fluency indicator in each study. The dependant variables were the number of correct words (Joy), the number of phonemic switches (Joy), the number of semantic switches (Joy), the number of correct words in the category Unpleasant-Fear, and number of semantic clusters, the number of semantic switches, the number of phonemic switches in the category Unpleasant-Fear. The predictors were anxiety trait, negative affect trait, positive affect state, sex, age, and education (in years). A regression model was significant for each above mentioned affective verbal fluency indicator (for all dependant variables). Four variables (sex, age, education and positive affect state, sex, age, and education) were included in the same semantic clusters. These results may be determined by emotional characteristics of women and men.

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Women (n=138) M (SD)</th>
<th>Men (n=164) M (SD)</th>
<th>F_{(1,300)}</th>
</tr>
</thead>
<tbody>
<tr>
<td>Correct words</td>
<td>7.81 (4.30)</td>
<td>6.04 (4.11)</td>
<td>13.17***</td>
</tr>
<tr>
<td>Phonemic clusters</td>
<td>.00 (.00)</td>
<td>.00 (.00)</td>
<td>.</td>
</tr>
<tr>
<td>Phonemic switches</td>
<td>6.81 (4.30)</td>
<td>5.06 (4.09)</td>
<td>12.99***</td>
</tr>
<tr>
<td>Semantic clusters</td>
<td>.44 (.67)</td>
<td>.30 (.62)</td>
<td>3.75*</td>
</tr>
<tr>
<td>Semantic switches</td>
<td>5.50 (3.17)</td>
<td>4.21 (3.20)</td>
<td>10.26***</td>
</tr>
</tbody>
</table>

Table 3. Descriptive statistics for affective verbal fluency by sex (category Pleasant: Joy) (N = 302). M – mean value, SD – standard deviation **. * p < .05, *** p < .001.

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Women (n=138) M (SD)</th>
<th>Men (n=164) M (SD)</th>
<th>F_{(1,300)}</th>
</tr>
</thead>
<tbody>
<tr>
<td>Correct words</td>
<td>13.36 (4.14)</td>
<td>13.24 (4.24)</td>
<td>.05 ns</td>
</tr>
<tr>
<td>Phonemic clusters</td>
<td>.02 (.14)</td>
<td>.03 (.21)</td>
<td>.46 ns</td>
</tr>
<tr>
<td>Phonemic switches</td>
<td>12.43 (4.06)</td>
<td>12.17 (4.26)</td>
<td>.28 ns</td>
</tr>
<tr>
<td>Semantic clusters</td>
<td>.87 (.77)</td>
<td>.95 (.92)</td>
<td>.55 ns</td>
</tr>
<tr>
<td>Semantic switches</td>
<td>9.98 (3.53)</td>
<td>9.59 (3.81)</td>
<td>.85 ns</td>
</tr>
</tbody>
</table>

Table 4. Descriptive statistics for affective verbal fluency by sex (category Unpleasant: Fear) (N = 302). M – mean value, SD – standard deviation. **. * p < .05, *** p < .001.
of 25% of the variance in the use of the correct words in category Joy. A model of regression accounts for 19% of the variance in the semantic switches and 18% of the variance of the phonemic switches in the category Joy. The regression analysis showed that the number of correct words, the number of phonemic and semantic switches in the category Joy increase with educational level, and the number of words and phonemic switches decrease with age. Education is an important and significant predictor for all of these variables. Sex is a significant predictor for the number of correct words, semantic and phonemic switches in the category Joy. To the contrary, the anxiety trait and the negative affect trait were not significant predictors for the category Joy. Positive affect state correlated positively with number of words, phonemic and semantic switches in the category Joy. These indicators of verbal fluency increase with positive affect state. Similarly, a model of regression explained 24% of the variance in naming words in the category Fear, 25% of the variance in the phonemic clusters, 20% of the variance in the semantic switches, 9% of the variance in semantic clusters in the category Fear. All these indicators increase with educational level. Education was a strong and significant predictor for each indicator in the category Fear. Age was not significant predictor for this category. Sex was a significant predictor for three indicators: the number of correct words, semantic and phonemic switches. No significant correlation was found between the anxiety trait, negative affect trait and verbal fluency indicators in the category Fear. These emotional traits were not predictors for emotional verbal fluency. To the contrary, positive affect state was significant predictor for the number of correct words, semantic and phonemic switches in the category Fear.


<table>
<thead>
<tr>
<th>Predictors</th>
<th>JCW</th>
<th>JSS</th>
<th>JPS</th>
<th>FCW</th>
<th>FSC</th>
<th>FSS</th>
<th>FPS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age - β</td>
<td>-.13**</td>
<td>-.08</td>
<td>-.13*</td>
<td>.00</td>
<td>.00</td>
<td>.00</td>
<td>.00</td>
</tr>
<tr>
<td>Sex - β</td>
<td>-.14**</td>
<td>-.14**</td>
<td>-.15**</td>
<td>-.15†</td>
<td>-.08</td>
<td>-.14**</td>
<td>-.15**</td>
</tr>
<tr>
<td>Education - β</td>
<td>.14**</td>
<td>.37†</td>
<td>.34†</td>
<td>.43†</td>
<td>.26**</td>
<td>.40†</td>
<td>.44†</td>
</tr>
<tr>
<td>STAI2 - β</td>
<td>.01</td>
<td>.01</td>
<td>.13</td>
<td>.12</td>
<td>.03</td>
<td>.12</td>
<td>.11</td>
</tr>
<tr>
<td>Neg. affect trait - β</td>
<td>.13</td>
<td>.01</td>
<td>.16</td>
<td>.10</td>
<td>.04</td>
<td>.10</td>
<td>.10</td>
</tr>
<tr>
<td>Pos. affect state - β</td>
<td>.19†</td>
<td>.14*</td>
<td>.19**</td>
<td>.13*</td>
<td>.09</td>
<td>.12*</td>
<td>.13**</td>
</tr>
<tr>
<td>R</td>
<td>.50</td>
<td>.44</td>
<td>.43</td>
<td>.49</td>
<td>.30</td>
<td>.45</td>
<td>.50</td>
</tr>
<tr>
<td>R²</td>
<td>.25</td>
<td>.19</td>
<td>.18</td>
<td>.24</td>
<td>.09</td>
<td>.20</td>
<td>.25</td>
</tr>
<tr>
<td>F(6,295)</td>
<td>12.46†</td>
<td>11.51†</td>
<td>11.13†</td>
<td>15.95†</td>
<td>4.98**</td>
<td>12.54†</td>
<td>16.27†</td>
</tr>
</tbody>
</table>

Qualitative analysis of the first six named words
Although women displayed higher anxiety trait and negative affect trait, these emotional characteristics were not significant predictors for women’s better scores in emotional verbal fluency tasks. A qualitative analysis of the first six named words in the categories Joy and Fear in men and women has been done to better understand sex differences in notions of Joy and Fear. The first six named words in women and men were recorded and counted. Then, a hierarchical cluster analysis using the squared-Euclidean distance and the nearest neighbor method was conducted. The differences between structure of Joy and Fear in men and women were identified. Structure of Joy for women included three main clusters: I emotions (love, happiness, friendship, euphoria, smile, crying, and amusement), II family (child, family), III activity (dance, adventure). Structure of Joy for men was different, it included five main clusters: I goods (presents, car, and money), II activity (travel, beach, relax, palm), III objects (cat, dog, and fish), IV emotions (love, amusement, and sadness), V general existential aspects (life, freedom, and people). The interesting differences between women and men were shown also in the notion of Fear. Semantic structure of Fear in women contained four main clusters: I emotions (anxiety, sadness, panic, fear, stress, aggression), II suffering (illness, pain, and death), III darkness (night, ghost, evil), IV symptoms of emotions (crying, shout, tears).
cluster analysis identified nine clusters in semantic network of Fear in men: I specific cause (accident), II general cause (danger, war, death), III darkness (night, dream, forest, ghost), IV problem (conflict, load, worry), V job situation (job, future), VI emotions (aggression, anxiety, fear), VII objects potentially dangerous (wolf, tiger, bee), VIII symptoms (eyes, lips, ears), IX another type of cause (film, horror). This cluster analysis showed that women's semantic networks related to emotional information (joy, fear) are differently structured than those in men.

3.2. Neural mechanisms and sex differences

The current findings may be explained by the different neural mechanisms of processing affective and neutral information. The present study focused on two forms of linguistic production (verbal fluency): neutral and affective. The emotional and the neutral language have the different neural mechanisms. The contrast of negative and positive to neutral emotional stimuli is reported in many studies. This contrasting mechanism is determined by the activation of different brain regions. Positive valence of words is related to higher response in the hippocampus (Kuchinke et al., 2005), and the lingual gyrus (Kensiger and Schacter, 2006). Negative words result in stronger responses in the lateral prefrontal cortex, the superior temporal and the inferior parietal gyrus (Kuchinke et al., 2005; Kensiger and Schacter 2006). Emotional language, in contrast to neutral language, provoked neural activity in the frontal regions. The superior medial frontal gyrus is engaged in the generation and processing of emotional semantic information (Ethofer et al., 2006). The inferior frontal gyrus is involved in the evaluation of emotional meaning. The bilateral orbitofrontal cortex is employed in the emotional language processing (Vuilleumier, 2005). The orbitofrontal gyrus has the connections with the amygdala, and that is why is assumed to influence the emotional processing (Hamann and Mao, 2002). In some studies the increased activation of amygdala for emotional linguistic stimuli has been observed (Cato et al., 2004; Kensinger and Schacter, 2006). Most listed regions show activation for emotional linguistic material such as the putamen, nucleus accumbens, anterior and posterior cingulate gyri (Cato et al., 2004; Crosson et al., 2002; Vuilleumier, 2005).

The current results on semantic verbal fluency are in line with many previous studies, including analysis using large sample, that sex is not a significant predictor for semantic verbal fluency tasks, and education positively correlates, whereas age correlates negatively with verbal fluency performance (Brickman et al., 2005; Capitani et al., 1998; Dursun et al., 2002; Tombaugh et al., 1999). The found sex differences in the emotional verbal fluency are not related to general differences in brain structure and activity of central neural system in men and women. The meta-analysis of the research on brain structure and language processing, brain size, volume of grey matter, size of corpus callosum, cortical asymmetry, and cortical neural density presented no significant effect for sex (Wallentin, 2009). Moreover, sex difference in verbal skills, language processing and neuroimaging of lateralization are not confirmed (Ashton and McFarland, 1991; Sommer et al., 2008; Wallentin, 2009). The possible explanation of the found differences in emotional verbal fluency refers not to the general discrepancies in brain size or brain structure, but to the use of different neural mechanisms by men and women for processing and encoding emotional information. Women had more brain regions correlated with emotional processing, subjective emotional experience, and encoding affective experience in memory (Canli et al., 2002). Amygdala activation correlated with better memory for intense emotions in both hemispheres, but is higher in the left hemisphere for women. Men activated the right amygdala more intensely than women. Women exhibited correlations between activation in the postcentral gyrus and hippocampus and emotional experience. Men differ from women in the activation in the putamen during emotions. Some of areas correlated with emotions are common for both sexes, such as the left anterior cingulate, fusiform and precentral gyri (Canli et al., 2002; Phelps et al., 2001).

3.3. Unconscious emotional schemata

We hypothesized that a possible explanation of current results may refer to women's emotionality. However, women differ from men in affective characteristics (they possess a tendency toward negative affectivity, more frequently experience fear and have higher anxiety than men, use negative strategies for solving problems, have positive attitudes

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toward anxiety, use cognitive avoidance - Ben-Zur and Zeidner, 1988; Cohen, 2009; Mulac et al., 1990; Robichaud and Dugas, 2002) - these negative affective traits did not explain sex differences in the performance of tasks in the category Joy or Fear. A regression analysis showed that positive affect state (which is lower in women) was a significant predictor for better scores in the categories Joy and Fear. This may refer to the role of positive affect on cognitive activity; positive affect makes additional cognitive material available for processing, increases number of associations, increases cognitive flexibility, and leads to defocused attention and more complex cognitive contexts (Amabile et al., 2005).

The first presented possible explanation of current findings in affective verbal fluency refers to neural mechanisms which explain the differences in emotional evaluation and encoding emotional experience in men and women. The second possible explanation is related to cognitive mechanisms (cognitive schemata). A hierarchical cluster analysis confirmed that women's semantic networks related to the emotional information of Joy and Fear are differently structured than those in men. Semantic networks of two emotional words Joy and Fear in women are more transparent and more emotional than in men. Women possess different cognitive structures of joy and fear; they understand these two notions differently than men do. For men joy and fear are less emotional, more complex, and not so clear as for women.

Cognitive schemata or mental representations of these two emotions are different in men and women. It confirmed that women and men encode emotional experience differently. They also use different strategies for recalling emotional information. Two hypotheses for the described differences may be proposed: the “affect-intensity” hypothesis which posits that women experience life more intensely and may encode emotions better in memory, and the “cognitive-style” hypothesis which argues that women use different strategies for encoding, recalling, as well as generating affective information (Fujita et al., 1991; Seidlitz and Diener, 1998).

4. Conclusion and outlook
The structure of emotional representations or affective unconscious schemata may have impact on the strategies of recalling verbal information. In the present research affective traits and participant's mood were taken into consideration. These factors modified the affective verbal fluency tasks, especially positive affect state which increased verbal fluency scores. A cluster analysis showed very important results that structures of semantic networks of emotions of Joy and Fear differed in men and women. This has important impact on the strategy of recall of emotional information. It confirmed that the emotional notions are different in men and women. They perceive and understand emotions differently. Future phase of research should be focused on use of functional magnetic resonance imaging to confirm the presented explanations.

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