SUMMARY

Studies concerning emotional changes following brain damage neglect the emotional responses that might arise in reaction to the stimuli used in their examination of such patients. Yet those reactions may be quite forceful often provoking feeling of anxiety or panic and dismay. A questionnaire designed to reveal associations and emotional attitudes was presented to 96 extramural students. Four categories of products and the products within those categories were selected. The categories included: sweets, alcohol, transportation, and consumer electronics. In addition, 174 participants of various ages and professions produced associations linked to emotionally loaded words. A list of associations and their dominance scores were created. It revealed that transportation (4.9) and consumer electronics (5) were given the highest mean scores. Also, the terms car (5.3) and mobile phone (5) aroused the highest levels of emotion. The significance of the emotional attitudes of the participants to objects were determined within particular dimensions that measured likableness, interest, goodness, and attractiveness. The terms beer, chocolate, car and mobile phone were reported to be most acceptable in all four dimensions. The above data suggests that the emotional attitude awakened by a particular object finds its expression in all of the dimensions examined.

The studies revealed the significance of primary subconscious affects for creating positive or negative attitudes. This should be taken into account by therapists since objects which evoke a negative affect may trigger a patient’s reluctance to take part in the rehabilitation procedure.

Key words: emotional attitudes, word associations, emotional reactions, objects, perception
INTRODUCTION

Emotional changes following brain damage have been studied for decades (Binder, 1984; Borod et al., 2002; Feinstein, 2013; Gainotti, 1972, 2001; Morga, Adamek, MacQueen et al., 2019; Pąchalska, Kaczmarek, & Kropotov, 2014). As a rule, papers that concentrate on the impact of brain damage on patient well-being are linked to irritability, frustration, anxiety, depression, the lack of capacity to empathize with others and to initiate affection. Strong emphasis is also placed on family problems caused by changes in the emotions, cognition and behavior of the patient (Binder, 1984; Halligan, Kischka & Marshall, 2003; Robinson, 2006). However, little attention was payed to the emotional responses that may arise in reaction to the stimuli used in the examination of such patients. Clinical practice shows that these reactions may be quite strong and usually negative, also, they quite often lead to a feeling of anxiety or even dismay. The importance of the careful selection of materials used in the course of diagnosis and therapy is magnified by the fact that information about having a brain tumor evokes strong stress, which may induce the symptoms of PTSD (Morga, Adamek, MacQueen et al., 2019).

Describing pictures or picture stories is the most common procedure for examining brain damaged patients. It should be borne in mind that pictures that may seem to be emotionally neutral to the examiner might provoke strong emotional reactions in the patient due to his recent experience. It may be appropriate at this point to recall the idea of the primacy of affect over cognition which was first formulated by Wundt (1907). The idea was then developed and experimentally tested by Zajonc (1980, 1984) and Murphy (2014) who showed that our like or dislike of neutral stimuli is affected by our previous exposure to positive or negative cues. That view was challenged by Lazarus (1984) who asserted that emotions result from cognitive appraisal. As is often the case in psychology, this disagreement was provoked, at least in part by the lack of a clearly defined meaning for the term in question. It appears that Zajonc was referring to affects while Lazarus was concerned about emotions. To put it in a different way, Zajonc and Murphy were studying basic emotional reactions that arise without any conscious awareness of the subject, and the objections of Lazarus followed from his concentration on complex mental constructs that require a conscious appraisal. That distinction corresponds to Damasio’s conception of primary and secondary emotions (Damasio, 1994, 2003) though Russell and Barrett’s distinction between core affects and emotions would seem to be more appropriate in this case (Russell & Barrett 1999). In her later work Barrett (2016) uses the term affective states in opposition to emotions, while in her recent book (Barret, 2017) she proposes the term basic feelings. She further argues that basic feelings reflect positive or negative arousal in reaction to the events that occur in the environment, and as a rule do not require full awareness. Hence, these basic feelings reflect a state of pleasure or displeasure. According to Barrett, the emotions of fear, sadness or happiness need appraisal and are created on the basis of our previ-
ous experience and linguistic labels. We need to understand the concepts of particular emotions in order to recognize them.

The presumption above is of primary relevance to our deliberations. We can use it to explain why we often feel uneasy, excited or in a good mood without a sound (i.e. possible to explain) reason. Only after giving it some considerations while trying to explain our feelings, we might say that we are sad, proud or happy. In this respect Lazarus (1984) was correct to state that recognizing emotional states requires cognitive appraisal. In the case of brain damaged patients this appraisal is often disturbed or even impossible due to impairments of the cognitive processes. Moreover, the instability of the general brain state makes them prone to exaggerated reactions to external stimuli, and to emotionally loaded stimuli in particular.

Unfortunately, the pictures that are generally used in diagnostic, therapeutic, and experimental procedures often bear heavy emotional messages. Hence, they may provoke strong affective – usually negative – states, which may have a significant impact upon the results, and consequently, the interpretation of the data gathered. A good example of this problem is a clinical experiment conducted by Marshall and Halligan (1988). They presented a patient suffering from a left

![Fig. 1. Hybrid drawings for neglect assessment](Source: Pąchalska, Kaczmarek & Kropotov, 2014: 242.)
visuo-spatial neglect two line drawings of a house. The house on the left side was on fire and the patient was asked which house she would prefer to live in. She pointed to the one that was not burning but insisted that both houses were identical. Pąchalska, Kaczmarek and Kropotov (2014) argue that the choice of this patient could have been driven by emotions evoked by the burning house, which activated phylogenetically older subcortical structures closely connected with processing emotionally loaded stimuli. As mentioned above, the affective arousal provoked by such stimuli seems to be confirmed by some reactions of patients with visuo-spatial neglect to hybrid animal images originally used by Luria (1959). As a rule they did not see anything extraordinary in such pictures and simply drew the animal that they had named. One of the patients drew a dog and stated that he would not like to own such an animal after being presented with a half-dog half-fish picture (see: fig. 1). Another complained about having nightmares since he had dreamt about really scary animals.

Unfortunately, clinicians do not take into consideration the emotional impact of the therapy tools they are using. Some forms of therapy may inadvertently create serious disturbances as brain damaged patients display emotional disorders more frequently than other patients (see Pąchalska, Kaczmarek & Kropotov, 2014). Even if some clinicians are fully aware of it, they find it difficult to evaluate the emotional valence of their tools. The same difficulties were encountered by psychologists while interpreting the emotional impact of advertisements. They knew that the most effective way of advertising is to appeal to the emotions but they did not know how to evaluate the emotional meaning of the material that they wanted to use. An interesting solution was proposed by Kleine and Kernan (1988). They developed a reference system based upon the method of continued associations (Szalay & Deese, 1978) which makes it possible to measure the meaning assigned to advertising. Moreover, that procedure makes possible to formalize meaning as well as emotional attitudes.

**MATERIAL AND METHODS**

A questionnaire revealing associations as well as the emotional attitudes of the participants was presented to 96 extramural students, and each association was assigned a dominance score. Four categories of products and the products linked to those categories were selected with the help of competent judges. The following sets were selected: sweets – cakes chocolate; alcohol – vodka, beer; transport – car, motorcycle, and home electronics – television set, mobile phone. Competent judges also selected subcategories with the use of a Lickert scale ranging from 1 to 5. The choice of 1 meant that there was a very low connection with the main category, while 5 reflected a very close connection. This made it possible to single out subcategories closely linked to the main category.

The participants were asked to produce all the one-word stimulus-bound responses. Each response was assigned a dominance score (DS), which reflected the salience of the object’s meaning. The responses were then categorized in
accordance with the sequence of their importance (their salience). The first responses were assumed to be most dominant. This allowed for the evaluation of both the idiosyncratic meaning and that shared by the group. Accordingly, each association was assigned a numerical value (dominance score) in the following order: first association: 6, second association: 5, third association: 4, associations from fourth to seventh: 3, eighth and ninth association: 2, tenth association and subsequent associations: 1. Emotional attitudes were assessed in four dimensions: cannot be liked/can be liked; uninteresting/interesting; bad/good; repulsive/inviting. The participants were asked to record their attitude towards particular objects on a 7-points Lickert scale. Number 1 meant a negative attitude and number 7 a positive one.

The first study comprised students, who are a special group, therefore, we also conducted other studies with groups of various ages and professions. In total, the studies included 174 participants. The technique of free association was applied in this case.

RESULTS

A list of associations and their dominance scores was created on the basis of the data obtained. The data revealed that transport (4.9) and home electronics (5) were assigned the highest mean scores. At the same time, a car (5.3) and a mobile phone (5) proved to arouse the highest emotions. Table 1 is an example of the association distribution within the category of transport.

It may be noted that the term motorcycle elicits associations with negative connotations such as danger, risk, showing off and accidents, while the term car is associated mainly with positive notions such as travelling, mobility and freedom. At the same time, motorcycle is also associated with freedom, and fun which means that it induces positive feelings as well as negative ones.

Table 2 shows that sweets generally evoke positive associations, such as pleasure, bliss, well-being, delight or good humor. They all are linked to a good mood which may result from the experience of rising dopamine levels in reaction to the consumption of products containing sugar. At the same time, people realize

<table>
<thead>
<tr>
<th>CATEGORY: TRANSPORT</th>
<th>ASSOCIATION GROUP</th>
<th>VALUE OF ASSOCIATION</th>
<th>EXAMPLES</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Means of transport</td>
<td>783</td>
<td>car; bus; train</td>
<td></td>
</tr>
<tr>
<td>2. Spare parts</td>
<td>315</td>
<td>wheels; tires; engine</td>
<td></td>
</tr>
<tr>
<td>3. Journey</td>
<td>135</td>
<td>travelling; mobility; road</td>
<td></td>
</tr>
<tr>
<td>SUBCATEGORY: MOTORCYCLE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Threat</td>
<td>650</td>
<td>accidents; danger; risk</td>
<td></td>
</tr>
<tr>
<td>2. Free time</td>
<td>403</td>
<td>hobby; freedom; fun</td>
<td></td>
</tr>
<tr>
<td>3. Speed</td>
<td>327</td>
<td>speed; racing; showing off</td>
<td></td>
</tr>
<tr>
<td>SUBCATEGORY: CAR</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Journey</td>
<td>579</td>
<td>travelling; mobility; freedom</td>
<td></td>
</tr>
<tr>
<td>2. Car parts</td>
<td>365</td>
<td>wheels; driver; engine</td>
<td></td>
</tr>
<tr>
<td>3. Comfort</td>
<td>276</td>
<td>comfort; convenience; utility</td>
<td></td>
</tr>
</tbody>
</table>
that overabundant sugar consumption may lead to obesity and tooth decay. Overall, the distribution of associations provoked in the examined subjects in response to the examined categories were in most cases positive. A similar pattern of associations was also observed in response to two other words, though the subjects were apt to produce more neutral words in this case.

The data in table 3 presents the significance of the emotional attitudes of the participants to objects within particular dimensions that reflect likableness, interest, goodness, and attractiveness. It was found that the terms beer, car and mobile phone were reported to be most acceptable terms in all four dimensions. Within the category of sweets, cookies were found to be more inviting than chocolate. Yet chocolate was believed to be more likable, interesting and better than cookies. The above findings allow for the conclusion that the emotional attitude awakened by a particular object finds its expression in all examined dimensions. It may be, therefore, inferred that it is primarily an affective reaction to a given object that underlies other emotional reactions. Such an interpretation is in agreement with contemporary studies concerning emotions (see Barrett, 2017, Shouse, 2005).

The use of the technique of free association is based on the assumption that it will produce a broader picture of the words that participants use in reaction to the stimulus that they are presented with. Contrary to the expectations the participants only produced limited numbers of associations although emotionally loaded terms tended to elicit more words. The young participants were especially reluctant to use many words, which reflects the recently observed tendency to use a restricted type of language. In other papers we argued that this tendency is a consequence of the use of short written messages while communicating via mobile phones and the Internet. This leads to a gross simplification of language, which acquires all the features of a limited code (Kaczmarek & Markiewicz, 2009; Kaczmarek, 2019).

### Table 2. Typical associations and dominance scores of participants within the category of sweets

<table>
<thead>
<tr>
<th>ASSOCIATION GROUP</th>
<th>VALUE OF ASSOCIATION</th>
<th>EXAMPLES</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Snacks</td>
<td>966</td>
<td>candies; chocolate; candy bars, cookies</td>
</tr>
<tr>
<td>2. Pleasure</td>
<td>444</td>
<td>bliss; nice mood; happiness</td>
</tr>
<tr>
<td>3. Illness</td>
<td>339</td>
<td>obesity; tooth decay; diabetes</td>
</tr>
</tbody>
</table>

**SUBCATEGORY: COOKIES**

<table>
<thead>
<tr>
<th>ASSOCIATION GROUP</th>
<th>VALUE OF ASSOCIATION</th>
<th>EXAMPLES</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Backery products</td>
<td>956</td>
<td>backery goods; cakes; recipes</td>
</tr>
<tr>
<td>2. Pleasure</td>
<td>620</td>
<td>well-being; relax; time with loved ones</td>
</tr>
<tr>
<td>3. Ingredients</td>
<td>531</td>
<td>sugar; cream; dried fruit</td>
</tr>
</tbody>
</table>

**SUBCATEGORY: CHOCOLATE**

<table>
<thead>
<tr>
<th>ASSOCIATION GROUP</th>
<th>VALUE OF ASSOCIATION</th>
<th>EXAMPLES</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Type</td>
<td>835</td>
<td>bitter; milk; white</td>
</tr>
<tr>
<td>2. Pleasure</td>
<td>619</td>
<td>happiness; delight; good humor</td>
</tr>
<tr>
<td>3. Dessert</td>
<td>282</td>
<td>cream; ice-cream; cake</td>
</tr>
</tbody>
</table>
Table 3. Significance of differences in a given category and its subcategories for all dimensions of affective attitudes

<table>
<thead>
<tr>
<th>Category</th>
<th>Mean</th>
<th>Subcategory</th>
<th>Mean</th>
<th>Significance</th>
<th>Category</th>
<th>Mean</th>
<th>Subcategory</th>
<th>Mean</th>
<th>Significance</th>
<th>Subcategory</th>
<th>Mean</th>
<th>Significance</th>
<th>Subcategory</th>
<th>Mean</th>
<th>Significance</th>
<th>Subcategory</th>
<th>Mean</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sweets</td>
<td>6.00</td>
<td>Cookies</td>
<td>6.15</td>
<td>.357</td>
<td>Sweets</td>
<td>6.00</td>
<td>Chocolate</td>
<td>6.39</td>
<td>.037</td>
<td>cookies</td>
<td>3.37</td>
<td>.000</td>
<td>Beer</td>
<td>3.27</td>
<td>.000</td>
<td>Vodka</td>
<td>.000</td>
<td></td>
</tr>
<tr>
<td>Alcohol</td>
<td>4.82</td>
<td>Beer</td>
<td>4.71</td>
<td>.927</td>
<td>Alcohol</td>
<td>4.82</td>
<td>Vodka</td>
<td>3.27</td>
<td>.000</td>
<td>Beer</td>
<td>3.27</td>
<td>.000</td>
<td>Vodka</td>
<td>.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| Transport              | 5.96 | Car        | 6.56 | .000         | Motorization | 5.96 | Motorcyc 

* Kaczmarek et al., Emotional attitudes linked to common objects
DISCUSSION

The study presents an endevaour to quantitatively evaluate emotional attitudes towards common objects. Despite the vast volume of literature available concerning emotional disorders following brain injuries the emotional responses of brain-damaged patients to the diagnostic and/or therapeutic material presented to them has been largely ignored to date. At the same time, responses to emotional cues have been extensively studied in the field of marketing, often with the use of brain imaging techniques (for a review see Bell et al. 2018). Moreover, some attempts to measure the emotional meaning of words has been undertaken in this area of research (Falkowski & Sidoruk-Błach, 2017; Kleine & Kernan, 1988). That approach was adopted in our study in order to assess the prevailing emotional attitudes towards objects presented to the participants. The study comprised students and healthy persons of various ages and vocations, hence, it would be worthwhile to conduct further studies including those concerning a clinical population.

Promising results in this respect were reported by a study concerning patients with mood disorders. The study applied free association techniques with the use of neutral and emotionally loaded words combined with fMRI recording (Piguët et al., 2010). The recordings revealed the activation of in left fusiform gyrus and bilateral parahippocampal gyrus as well as activity in the left superior and medial frontal gyrus in reaction to the emotional cues presented to the patients.

The primacy of affect is also stressed by microgenetic theory (Brown, 2005, 2012; Pąchalska, Kaczmarek & Kropotov, 2014; Pąchalska, MacQueen, Cielebąk 2018).

It is in the cortex that perception and action reach the level of conscious decision. The brain forms articulated pictures or representations of what is out there in the world, and of what has been out there in the world, and the play of these images constitutes conscious perception. What is more, the cortex is capable of forming pictures and/or images (see: fig. 2) of what might be or could be out there, or could have been, or should have been, and was not – a fact that has only recently begun to be a subject of interest for neuropsychology (Pachalska, Góral-Pólrola, Mueller, Kropotov 2017; Pachalska, MacQueen, Cielebąk (2018).

It is not that hard to form a coherent theory of how the brain forms an image of something the eyes are seeing or have seen, but it is quite another thing to explain how the “mind’s eye” works in terms of brain structure and function.

For the present purposes, however, the most important fact about the cerebral cortex is that both perception and action at this stage are characterized by detail, discrimination, and analysis. The reptilian brain sees a large moving object, to be avoided, or seized, or ignored; the paleomammalian brain sees a human figure, producing an affect, positive or negative; the cortex sees features, details, a face, and can put a name to it, or not. The complexity of perception results from the fact that these three images come into existence independently and sequentially, though there is only one perceiver and one object, and the entire process takes
milliseconds to complete. The conscious mind, then, typically experiences its perception as a single, simple act of seeing. According to microgenetic theory, however, this single act is a multi-layered actualization, the tip of an iceberg that floats to the surface and then subsides, containing within itself the traces of all that has gone before, in phylogeny, ontogeny, and microgeny (Pachalska 2002). It is worth remembering that neural network patterns are not only related to memory processes but are also linked to processing of the self (Pachalska 2002; D’Argembeau et al., 2005). This may explain the tendency to ruminate, which is a characteristic of patients with mood disorders (Marchetti et al., 2012). For the present purposes, it is important that a pattern of verbal associations may be relevant for comprehending the emotional reactions of a clinical population).

CONCLUSIONS

The evaluation of emotional attitudes provoked by objects or their pictures to which the examined subjects were exposed is of great significance, since their reactions often have considerable impact upon the results both in experimental and clinical settings. The studies described above revealed the significance of
primary subconscious affects in creating positive or negative attitudes. This finding is of particular importance in the case of brain-damaged patients, since negative attitudes and feelings often result in the patient’s reluctance to take part in rehabilitation activities. These studies have a preliminary character, but they lay a path for further investigations.

REFERENCES


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