

How do negatively valenced pictures influence the episodic memory?

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Abstract

The aim of this study was to examine the influence of emotionally negative valenced pictures on the memory process. Appraisal theory of emotions was included as a framework for the understanding of how the emotional process functions with supplementation from evolutionary theory in order to develop the view. The memory process was understood in the frame of especially Tulving's (1986) distinction between episodic and semantic memory, providing for an for the thesis essential connection to the "Remember-Know" theory. Further, memory of emotional events was discussed within the frame of mainly forensic theory provided by Christianson (1992; 1996).

The study suggests that negative stimuli initiate faster and more thorough processing and that this causes a subsequent better representation in the episodic memory. Whereas a phenomenological qualitative difference consequently was identified, no similar difference in the quantity of remembered pictures was detected.

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The influence of negatively valenced pictures on episodic memory

Upon recall of past situations we often wonder and discuss how precise the recall is exactly. Often, the discussion is brought about by the fact that several versions of the situation in question are surfaced. Usually, the discussion is only of minor and personal interest for the persons involved, but on a few occasions the exact memory of an encountered event is of central, sometimes even lifesaving importance. When straining to recall such occasions, the occasions coming to mind are emotional and negative. One example being witnessing of crimes, where an exact testimony is essential in solving the crime, thus, preventing future crimes. Another example could be a particular insect to avoid, once a person has experienced a painful or life-threatening bite.

It is widely suggested that negative emotional events in many respects represent unique stimuli. Numerous and extensive research projects investigating this topic have been conducted in laboratory, experimental settings as well as in natural settings. The theme pursued in this thesis is related to how this uniqueness influences the impact negative emotional events have on their subsequent representation in our memory.

Theory of Emotion and Memory

Theory of emotion

Emotions are an interesting phenomenon. We all know what emotions are, we all experience them and emotions seem obvious. However, if we begin to question their exact content and definition they become quite abstract.

The discussion of and view on emotions in differing psychological theories is characterised by this intangible character. Depending on theoretical conviction, emotions are defined and viewed in quite different terms. One extreme we find in the social constructionist theories. In this view, emotions are an external social action created by the social relations among people, and seen in a broader perspective, by a distinct cultural history. In this way emotions are social constructions, and emotional expression only belongs to the individual in the fact that the individual is the one to carry out a given action (Gergen, 1997). Most other theories share the notion that emotions are inner processes and, thus, belong to or are part of the individual. But this basic, common point of departure only opens up for larger differences.

Consequently, a definition of the term “emotion” becomes rather diffuse unless it is linked to a specific theoretical background.

In the 1960’s a cognitive emotional theory emerged which gained large support. In this theoretical view, emotions consist of interpretations of a general condition of arousal of the body organs (Katznelson, 2001). The cognitive emotion theory coincides with another theory, appraisal theory which roots can be dated back to Aristotle. Appraisal theory has been chosen as the theoretical background for this discussion. The choice has been made for two reasons; first, the empirical part has its root within this theory and second, the appraisal theory offers a thorough and holistic approach to emotions. When estimated to create depth or clarification, evolutionary theory is included as a supplement.

Appraisal theory

Appraisal theories of emotion have their offspring in the early contributions from two different persons: Magda Arnold (1960) and Richard Lazarus (1966). Appraisal theories suggest that an emotional stimuli in itself does not elicit an emotion, the elicitation and differentiation of emotions follow as a function of evaluations – or appraisals – of a stimuli. Or phrased in other words, it is the interpretation of an event, not the event itself, which causes emotion. This explains that different individuals very well may respond emotionally different to a given situation – and that the same individual may respond differently to similar situations at different points in time (Scherer, 2001). In turn, it places the identification of the evaluative dimensions or criteria that foresee a particular emotion in focus of attention.

According to Arnold, appraisal is an intuitive assessment of the present aspects of a situation or an event as opposed to a rational and deliberate process (Scherer, 2001). However, later contributions suggest that appraisal can involve complex, conscious, high-level cognitive processes as well as they can involve simple, unconscious, lower-level cognitive processes (Scherer, 2001).

Lazarus has developed a cognitive-motivational-relational theory of emotions in which he distinguishes between appraisal at two different levels, a molecular and a molar level. The essence of the two levels together is to identify the core relational themes (Smith & Lazarus, 1993). By “core relational themes” is meant which meaning the particular event induces for the individual, whether it implies potential harmful or beneficial effects on the individual’s goals (Dahl, 2001).

The molecular level involves the individual's appraisal of the potential enhancement or threat of goals embedded in a given event or situation. The level involves two stages, primary and secondary appraisal.

Primary appraisal is an initial judgement of whether what is happening to the person is worth paying attention to. The primary appraisal concerns also whether what is happening is relevant to one's values, goal commitments, beliefs and situational intentions (Lazarus, 1991). This is the type of appraisal which causes the specific emotion to arise in terms of a particular behaviour (Frijda, 1993).

Secondary appraisal implies that the person evaluates the consequences of being in this particular environment or situation and what can be done about it, i.e. coping options (Lazarus, 1991).

The primary and secondary appraisals never stand alone, but operate dependently of each other. Lazarus sees them as each a partial meaning component of a complex cognitive-motivational-relational process. The matter of adaptation at the molecular level is composed by appraisal components, an overview of which is offered below:

Primary appraisal

- | | |
|---------------------------|---|
| 1.Goal relevance | Is the event relevant to the individual's well-being? If no goal is at stake, no emotion will be elicited. |
| 2.Goal congruence | Can the event facilitate or oppose the individual's goal? If it can facilitate, a positive emotion is elicited, a negative emotion if the opposite is the case. |
| 1.Type of ego involvement | Does the event involve a threat or strengthening of the persons "self"? |

If relevance is found, the second step follows.

Secondary appraisal

- | | |
|-----------------------|---|
| 1.Blame and credit | Who should be blamed and who credited? |
| 1.Coping potential | Which strategy can be implemented to prevent harm or profit from the event? In effect , coping prospects and outcomes have a strong influence on which emotion will be experienced and displayed. |
| 1.Future expectations | |

(Lazarus, 1991, p.55-56).

At this level, variables are involved which include the assessment of how close the event is in time and space, how serious the consequences will be and how difficult coping will be (Frijda, 1993). A continued judgement of relevance.

At the molar level the above appraisal components are combined into summaries of core relational themes. This is, the essential harm or benefit which constitute the foundation of each of the positive or negative emotions (Smith & Lazarus, 1993). This implies that a specific combination of appraisal components brings about a specific core relational theme. And this core relational theme is in its turn the main criterion for a categorisation of emotions into families, meaning that a family of emotions is defined by emotions which share the same core relational theme and above mentioned components of appraisal. There are two main families. The first is a family including all the classically negative emotions such as anger, fright, anxiety, guilt, shame, sadness, envy, jealousy and disgust. The common appraisal components for this family are goal relevance and incongruence. The second family includes the classically positive emotions such as happiness, joy, pride, love, affection and relief. The appraisal components shared by these emotions are goal relevance and congruence (Lazarus, 1991).

A visualisation of Lazarus' cognitive-motivational-emotive system, I believe, brings an informative and useful overview of the context of the above mentioned processes and categorisations.

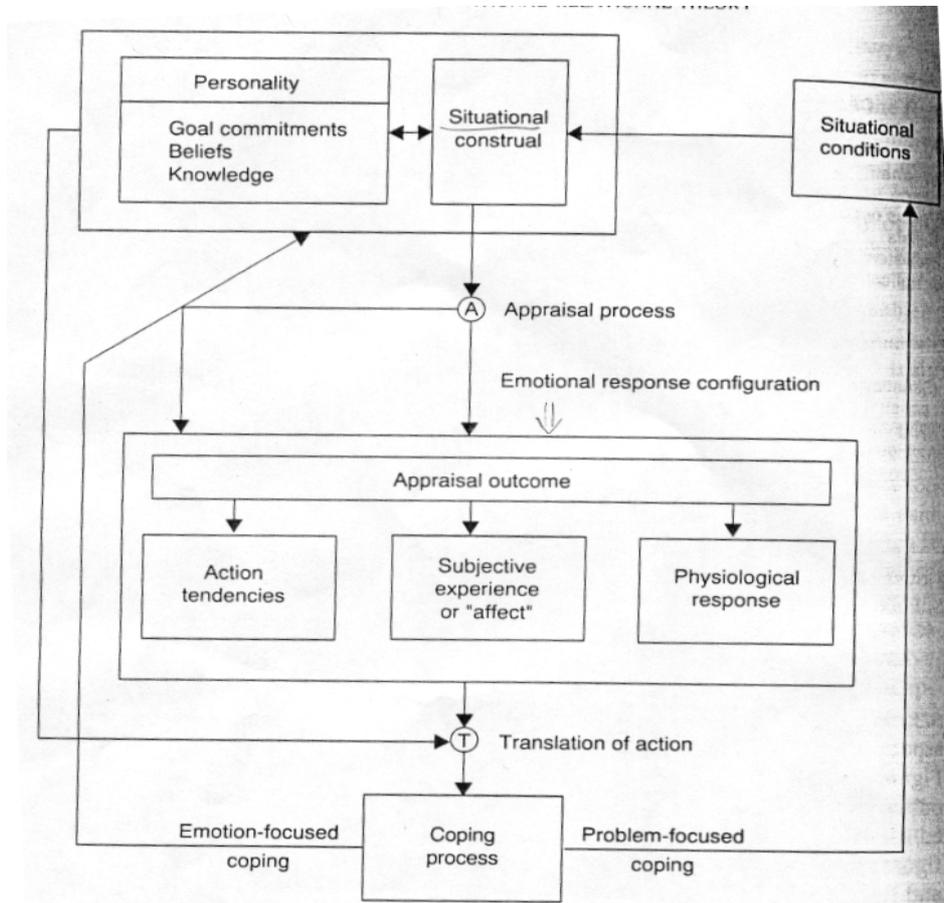


Figure 1: Model of the cognitive-motivational-emotive system (Lazarus, 1991, p. 210).

As visualised in the figure above, the system represents a cycle rather than a linear, finished system. At the top of the figure, we have the variables antecedent to the emotion process. They consist of two different types, intrapersonal factors and situational factors. Among the intrapersonal factors are goals, beliefs and motivation and these factors together with the situational factors, create to the situational construal which is realised in an appraisal outcome. The appraisal outcome, in turn, constitutes a mediating process, the immediate cause of all the following factors (Lazarus, 1991). Hence, the interaction between the specific situation or event and the history of the specific individual experiencing the situation

crystallises as essential for the outcome of the entire process providing a clear explanation for the fact that situations have the potential to evoke different emotions in different persons.

The appraisal outcome includes an outcome in regard to action, physiological response and subjective experience or affect. These are in turn translated into coping processes which are quite central in deciding which actual emotion occurs, and at which intensity. An example is when a person chooses a coping process of denial in a threatening situation instead of fear, the emotion elicited will be of a significantly smaller intensity. The coping process influences the antecedent factors of the system in an ongoing cyclic process implying that each single factor in the system influences each other variable (Lazarus, 1991).

From the above, if not a definition of emotion, at least a shape of what emotion is, is taking form. First, it visualises the importance of distinguishing emotions from reflexes and physiological drives in that the process of emotions excludes responses which are elicited inflexibly and automatically by specific stimuli (Lazarus, 1991). Second, that emotion is a multidisciplinary concept drawing not only on psychological but also on societal and physiological levels.

Negative versus positive emotions

As this thesis aims to distinguish between the effects of positive and negative emotional inputs, it is found relevant to include a brief discussion of the differences between the two. An evolutionary perspective will be drawn upon as a valuable assistance in proposing a reason why a threatening stimulus seems to provoke an allocation of cognitive resources. The evolutionary perspective is all the more a suitable supplement to appraisal theory as many of the appraisal theorists build on or are in accordance with this perspective (Dahl, 2002).

Most theorists seem to agree that the response pattern to negative events differ from those to positive events – a negative event defined as an event which has a potential to create disadvantageous outcomes for the individual. According to Taylor's mobilisation-minimisation hypothesis, the response to negative events seems to distinguish itself by mobilisation of the organism as a short-term reaction and minimisation of the consequences in the long-term. "All other things equal, negative events appear to elicit more physiological, affective, cognitive and behavioural activity and prompt more cognitive analysis than neutral or positive events" (Taylor, 1991, p. 67).

The mobilisation phase concerns the encoding of the information provided in order to elicit the most appropriate response immediately. The following minimisation concerns a

hypothesis that a coping process is initiated in order to minimise the long-term effects of the negative stimuli (Taylor, 1991).

In the evolutionary-ecological view, fear is explained by causal factors at three levels: short-term adaptive processes, a life-span of individual learning and the evolutionary given gene pool (Öhman, 1986). Placing this in Lazarus' model of the cognitive-motivational-emotive system, the gene pool is part of the intraindividual factors. The life-saving essence of the negative emotion, fear, gives a possible explanation for the assumption that negative emotions evoke a different, faster and clearer encoding of information than do positive emotions. An interesting notion is that in order to trigger this explicit response, the stimulus has to be directed towards the person (posing a direct threat or uncomfortable situation) (Öhman & Dimberg, 2001). I will return to the suggestions regarding emotional stimuli in relation to their importance to the memory process.

Theory of Memory

The extensive literature regarding the human memory suggests a massive complexity and a vast variety of subdivisions and distinctions between differential aspects of memory. The main view and distinctions chosen as theoretical background for this thesis is represented by Tulving (1985 and 2000).

The first subdivision Tulving suggests is between procedural and propositional memories. The first category, the procedural memory, is composed of a large number of perceptual-motor skills and cognitive skills which the individual has acquired by practice. The second category, propositional memory, is composed of a multiplicity of knowledge. Knowledge which can be expressed and represented symbolically and which can be acquired in a single moment (Tulving, 1985).

The category of memory relevant in this connection is the propositional memory. Being a category, propositional memory further breaks down into two subsystems, the episodic and semantic memories. The distinction between episodic and semantic memories is found in the lines between the personal and the public world. Whereas episodic memory is involved in the recording and following retrieval of memories connected to personal incidents and actions, the semantic memory is involved with public knowledge, meaning knowledge which is not connected to the individual's person or personal experience. The two systems interact closely but are, however, separate. They differ first and foremost with respect to the above mentioned kind of information they process and to the characteristics of their operations. However, they

are similar in the fact that they are both connected to acquisition, retention and utilisation of information and knowledge (Tulving, 1985).

Neither system stores information without processing. The processing causes memories to be interpretations of events representing what is relevant to the individual at the time of the event and at the time of the retrieval rather than being actual records of the event itself (Conway, 1997).

Tulving was the first to distinguish between two differential states of awareness reflecting auto-noetic and noetic consciousness (Gardiner & Richardson Klavehn, 2000). He first mentions a tendency to use the word “remember” for episodes and “know” for semantic memories (Tulving, 1985) later labelling the distinction “remembering” and “knowing”. The auto-noetic consciousness has been well proven to be a property of the episodic memory system, whereas the notion that the noetic consciousness should characterise the semantic memory system is more controversial. Numerous later experimental studies have supported and proved the remember/know distinction and have indicated that the two states of awareness are functionally independent (Gardiner & Richardson Klavehn, 2000).

Encoding into the two memory systems is assumed to vary as a serial system where events are encoded in the semantic system before they can be encoded in the episodic memory. It is suggested that encoding into the semantic system demands only some kind of initial awareness, whereas the encoding into the episodic memory system relies on larger conscious elaboration of the event or information (Gardiner & Richardson Klavehn, 2000). However, for both systems it is valid that awareness or attention in itself is not ensuring a memory. It is the quality of the processing operations initiated by the attentional resources which determines the memory – the larger the elaboration of one’s encodings, the better the subsequent memory (Brown & Craik, 2000).

Given that elaboration of the encodings is essential, the individual’s knowledge and beliefs become crucial in the guidance of the encoding. It is especially the general knowledge in the semantic system which guides the person in encoding new information. Remembering simultaneously reflects the interaction between encoding and retrieval processes (Brown & Craik, 2000). As a result, remembering can be seen as an interplay between individual qualities, learning activities, the event and the retrieval situation (Christianson, 1997).

Emotion and Memory

There is strong evidence and agreement that emotional events are remembered differently than ordinary, neutral events (Christianson, 1992). However, theorists have

disagreed tremendously in their theories of the direction of this difference. Some theorists have argued, supported by experimental research, that emotional events impair the subsequent memory of an emotional stimulus or event. Other theorists have, equally supported by experimental research, suggested contrarily that emotional stimuli enhances the following memory of the situation (Christianson, 1992).

Returning for a brief moment to the evolutionary perspective mentioned previously, not only recognition but also memory of emotional events, and negative events in particular, is seen to be crucial in order to ensure the initiation of behaviour appropriate to survive. Survival, the ultimate goal, is believed to a large extent to have depended on an emotional system sufficiently fast to alert the individual facing threatening or disturbing stimuli (Christianson & Engelberg, 1997).

This might imply that different sorts of emotional events will provoke varying reactions – also in terms of memory. According to Christianson (1992) this is exactly the case, and consequently, it is necessary to distinguish between differential types of emotional situations and various types of details remembered.

Research has supported the existence of “flashbulb” memories, initially suggested by Brown and Kulik in 1977 (Dahl, 2002). Research of flashbulb memories suggests that certain characteristics of negative emotional events are perceived and preserved automatically by specific mechanics which do not involve consciously controlled memory processes neither during encoding or retrieval (Christianson & Engelberg, 1997). Affect plays a larger and more important role in the episodic system than in the semantic system (Tulving, 1985), and flashbulb memories are exactly connected to an intense personal experience (Dahl, 2002). The essence of the theory behind flashbulb memories suggests that events which take place during intense emotional arousal are remembered especially clearly and accurately (Ledoux, 1992).

Another type of emotional memory somewhat similar to flashbulb memories is connected to the memory of traumatic events. There are especially two general memory mechanisms identified in traumatic events which are highly interesting and relevant in the frame of this thesis. One mechanism is connected to memory of central versus peripheral details, the other to a remember/forget mechanism.

The ways emotions effect memory are quite complex, partly because of the attention catching nature of emotional events. Previously it was established that some kind of poststimulus elaboration occurs, but no one has a complete explanation of the relative

importance between the distribution of attention at the time of the stimulus processing and the poststimulus elaboration in determining the memory result (Christianson, 1996; Christianson, 1992).

Evidence suggests that people remember more central than peripheral details of traumatic events. Christianson has established a positive relation between the emotion experienced in a given situation and the number of central details remembered from the situation, whereas no such relationship can be established with peripheral details – on the contrary, less peripheral details seem to be remembered (Christianson, 1996). The reason for peripheral details to be remembered less in emotional situations might be explained by the attention effect on emotional event provokes. A similar deficient has been determined in unusual situations. However, the enhanced memory of central details does only occur in the event of emotional – not unusual – situations (Christianson, 1996). An explanation for this unbalanced memory might be found in Eysenck's suggestion (1982) that high arousal causes an inability to involve parallel processing because the attentional capacity decreases to a degree where normal task processing is inhibited. Further, the coping activities necessitated by focussing on the critical aspects of an emotional event consume so large resources on conscious attention that resources left for processing of more peripheral information are limited substantially (Christianson & Engelberg, 1997).

This specific pattern that central details are remembered better and peripheral details poorer might result from the interaction between preattentive processes which have the function to direct the individual's attention on emotional information and more controlled processes, previously referred to as poststimulus elaboration. An interaction which focuses the processing on central rather than peripheral details (Christianson, 1992). The syndrome has also been labelled tunnel-memory (Christianson & Engelberg, 1997). The phenomenon is among other situations noticed in the situation where a weapon is directed at a person. In this situation, the attention focuses on the weapon, leading to a clear memory of the weapon whereas the ability to remember other information as for instance the person holding the weapon might be considerably impaired. This is called "the weapon focus effect" (Christianson, 1996).

The second mechanism mentioned above, is a mechanism which on the one hand exclude negative types of experience from our conscious awareness if the experience is of such character that it would otherwise prevent the individual from functioning well (forgetting process). Especially having faced a very traumatic event, this mechanism seems

practical and sometimes necessary for the individual to be able to cope and move on. The forgetting can be a matter of deficiency in encoding or retrieval. An interesting suggestion is that even in situations where the forgetting mechanism has ensured a lack of conscious awareness of an event, it has been proven in experiments as well as in natural situations that the individual can be capable of remembering the emotional information of the event, even if he or she is not aware of how and when she picked up the information initially (Christianson, 1992). On the other hand, the mechanism includes a remembering process which ensures that humans encode and are able to retrieve crucial information in relation to potential threats in order to respond according to a similar threat upon a later encounter (Christianson & Engelberg, 1997; Dahl, 2002).

Summary

The appraisal theory of emotions focuses to a large degree on evaluative dimensions of emotions. At the core of the theory is the notion that the nature of an elicited emotion is determined by the core relational theme and appraisal components of a particular event. Basically, an evaluation of whether an event is enhancing or threatening to the individual's goals. Emotions can both evolve as a result of conscious, controlled processes or of simple, unconscious processes. Importantly, the emotional process is viewed as exactly this, a cyclic process including influence from intrapersonal as well as situational factors. The resulting emotions, in their turn, are divided into emotion families, the larger two being negative emotions and positive emotions. The study conducted in this thesis focuses on the difference between these two emotion families.

There is vast evidence that the response pattern to negative emotional events is different from the response pattern to neutral or positive events. Emotionally negative events are suggested to elicit a mobilisation-minimisation effect, mobilising the individual to immediate response on encounter, but minimising the effect of the negative encounter in the longer term. In the first part of the study, response time is measured for recognition of negative versus positive emotional pictures. In order to be in line with the mobilisation-minimisation hypothesis, response time for negative pictures ought to be shorter than for positive pictures.

Memory is subdivided into categories and systems. One relevant categorisation is that of remembering and knowing. Remembering being connected to the episodic memory system, and knowing more doubtfully to the semantic memories. This categorisation has been implemented in the study to investigate whether negatively valenced pictures elicit higher episodic memory than positively valenced pictures. Further, memory is also affected by

intrapersonal and situational characteristics both in guiding encoding and in the retrieval situation. Emotional events influence the memory process, especially negative events as they influence the response pattern. Most importantly it is suggested that a negative emotional situation evokes an enhanced memory of central details, whereas memory of peripheral details is impaired. The reason for this phenomenon is apparently found in both the encoding and retrieval situation. There are pictures included in the study material which resemble each other in central details, but not in peripheral details. However, these pictures are not analysed explicitly, they appear as part of the material and can influence the number of false recollections in the latter part of the study as explained below.

The general hypothesis for the thesis was that negatively valenced pictures involve episodic memory to a higher extent than do positive pictures. And that this effect was at least partly caused by a greater attentional effect of negatively valenced pictures during encoding.

Method

Aim

The purpose of the study was to investigate the effect of negatively and positively valenced pictures in relation to the quality of subsequent recollective experience. It was expected to find a higher recollection of negative over positive pictures. Further, it was expected to find a faster recognition of negative pictures than of positive pictures and that more negative pictures were recognised in general than positive.

Method

25 persons participated in the study, 16 women and 9 men. The participants were mainly students at the university of Lund and were on average 25 years of age (ranging between 21 and 32).

The pictures were chosen from “The international Affective Picture System” (Lang, Öhman & Vaitl, 1988). Every picture is rated in relation to emotional valence and arousal level. The negative pictures picture bloody sceneries, violent accident scenes or dead animals. The positive pictures are aesthetically appealing with nature scenes or close human relations. The pictures were projected to a large screen (1200 mm) and the participants were sitting at a close range in order to create the impression of pictures as close to scale 1:1 as possible.

The study came in two phases. Both phases were preceded by a written instruction and a following discussion to ensure that the instruction was fully understood. During the first phase, participants were exposed to 4 pictures at a time, 3 neutral and 1 positive or negative. They were asked to choose the picture they found negative or positive and subsequently to grade the picture on a scale from +3 (very positive) to -3 (very negative). Exposure time was 800ms. In order for participants to get used to the brief exposure time, the first part constituted a test followed by 40 sets of pictures counting in the experiment (20 negative and 20 positive pictures). Besides a registration of correct versus wrong choice of picture, the response time for the participant to choose the picture was registered.

The instruction preceding the second phase was a standard instruction (Gardiner & Richardson Klavehn, 2000) of how to discriminate “remember from “know”. During the second phase, participants were exposed to one picture at the time (800 ms) and asked whether the picture was “old” (included in the first phase) or “new”. Upon recall of the particular picture, respondents were asked to evaluate the phenomenological quality of the recall in accordance with Tulving’s distinction between “remember” and “know”. A third option “guess” was included in order to allow for cases of doubt. The distinction between “remember” (kommer ihåg) and “know” (vet) was partly causing the preceding instruction to be extensive as it was difficult for some participants to comprehend and, thus, was explained in large detail.

The last question was directed at whether or not the picture was shown in the same position on the screen as the first time the participants were exposed to it. After the first and the last question, participants were asked to grade their certainty in percentages.

Results

The encoding phase of the study showed a significantly lower response time for recognition of negative pictures than of positive pictures [$F(1,21) = 26,11$; $p < 0,01$]. Table 1 includes means and standard deviations for the pictures respectively. Further, the proportion of correctly identified negatively valenced pictures was significantly higher than the proportion of identified positive pictures, [$F(1,21) = 59,9$; $p < 0,01$] (see table 1).

Table 1. *Means and SDs for reaction time for recognition of negative and positive pictures and quantity of recognised pictures*

| Reaction Time (ms) | Mean | St. deviation |
|--------------------|-------|---------------|
| Negative | 1.885 | 648 |
| Positive | 2.697 | 1.242 |

Correct recognition

| | | |
|----------|------|------|
| Negative | 0,81 | 0,53 |
| Positive | 0,12 | 0,15 |

Concerning the memory phase of the study, the hit-rate for both negative and positive pictures was measured against the amount of false alarms – pictures which had in fact not been shown before, but which were believed to be seen before and this was transformed into an index figure (hits - false alarms). The difference between the index for negative and positive pictures respectively is not significant [$F(1,22) = 1,26; p = 0,274$].

However, the results showed a significant difference in the phenomenological quality of the participant's recollective experience, as there is a larger proportion of "remember" answers for negative pictures than for positive pictures [$F(1,22) = 51,2; p > 0,01$]. Table 2 shows means and standard deviations for memory and valence.

Table 2. Means and SDs of the proportion of correct identification and the proportion of "Remember".

| Hits-false alarm | Mean | St. deviation |
|------------------|------|---------------|
| Negative | 0,49 | 0,14 |
| Positive | 0,45 | 0,11 |

"Remember" hits-false alarm

| | | |
|----------|------|------|
| Negative | 0,32 | 0,07 |
| Positive | 0,16 | 0,08 |

The last part of the study concerned whether a previously shown picture during the memory phase occurred in the same position on the screen as the first time exposed. The participants' performance in this part of the experiment was at a chance level and is due to a floor effect uninterpretable.

Discussion

The hypothesis of this thesis was divided into different levels, each part being discussed below in the same chronology as the study progressed.

A lower response time for recognition of negative pictures was predicted. This prediction was supported in the study since the average response time for recognition of negative pictures was twice as fast as the response time for positive pictures. This indicates that speed in reaction time upon facing emotional stimulus is affected by the valence of the stimulus. Negatively valenced stimuli seem to cause a fast recognition and reaction which can be interpreted within the frame of Taylor's mobilisation-minimisation hypothesis as a faster and clearer encoding due to mobilisation – allocation of cognitive resources towards a negative stimulus (Taylor, 1991). Supporting also the notion that the emotional system must be sufficiently fast to alert the individual upon facing threatening or disturbing stimuli (Christianson & Engelberg, 1997).

The expectation that the encoding would be clearer was similarly supported as there was a significantly higher proportion of correctly identified negatively valenced pictures.

The findings of higher speed and clarity are in line with the results of a number of research projects supporting the theoretical framework of this thesis (Taylor, 1991; Öhman & Dimberg, 1984; Christianson & Engelberg, 1984). Research projects which have more often than not been conducted as laboratory experiments. A laboratory setting raises an interesting problematic in respect to the notion that in order to elicit a different response, the negative stimulus should be directed towards the person him or herself (Öhman & Dimberg, 1984). In the terms of Lazarus' appraisal components, the negative pictures should generate relevance by threatening the person's goals in order to elicit an emotion (Lazarus, 1991). The assumption that an artificial threat or artificially imposed uncomfortable situation such as a picture is interpreted as a real situation lies implicitly in the construction of the laboratory study. The results seem to imply justification for the assumption and indicate that even pictures can provoke a level of discomfort relevant enough for the person to evoke a negative emotion and, thus, this particular response.

An important implication of appraisal theory is the interaction between intrapersonal and situational factors as determinants of the elicited emotions (Lazarus, 1991). The

investigation of this was not within the scope of the study, but it could, however, be mentioned that reactions from participants during the study were quite obviously different.

Concerning the memory phase of the study, participants were expected to have a higher recollection of negative pictures than of positive. This expectation did not find support as the study showed no significant difference in the quantity of recollected pictures. There could be different explanations for this result. There were as mentioned a number of pictures which were very similar in central details but differed in peripheral details. A part of the result might be explained by an expression of the tunnel syndrome. However, it is not possible to draw any plausible conclusions on the basis of the available data. A theory which seems to be contradicted by the results is the theory behind flash-bulb memories – stating that events taking place during intense emotional arousal are remembered especially clearly. It could on the other hand be argued, that the emotional arousal was not sufficiently high to evoke flash-bulb memories for at least a part of the negative pictures.

Nevertheless, the study did support the overall hypothesis that negative pictures involve a higher extent of episodic memory than do positive. Consequently, the results of the study can be seen to support Tulving's (1985) remember/know theory. Tulving suggests that the episodic memory relies on a larger conscious elaboration of the stimulus, and negative stimuli have been established to evoke a larger attentional effect as well as a larger subsequent poststimulus elaboration (Christianson, 1992). The theory of flash-bulb memories seems even more relevant in this relation and it can contribute to an explanation of the clear difference between the oppositely valenced pictures.

Conclusion

To summarise the findings of the thesis, the findings suggest that negatively and positively valenced pictures influence the memory process differently. The hypothesis that negative emotional pictures elicit a higher episodic memory found support. This is in agreement with Tulving's remember/know theory as concepts representing two differential states of awareness. Further, it is in line with the theory behind the concept of flash-bulb memories.

Another interesting finding in the study was connected to the encoding phase where negative pictures were found to cause faster and clearer recognition than positive pictures.

The findings are seen to agree with Taylor's mobilisation-minimisation hypothesis. Though negative emotional pictures were better recognised during encoding, there was no subsequent difference between the quantitative recollection of negative or positive pictures. The difference in memory was only found in the above mentioned quality of the recollective experience. It is not within the scope of this thesis to pursue the reasons for this phenomenon, but it would be relevant to investigate the underlying explanations as it might contribute to an indication of the balance between encoding and retrieval in the memory process. Perhaps the explanation in this study could be found in the simple notion that some pictures were not evoking sufficient arousal to elicit an emotional process.

The study included an amount of bloody pictures which were registered together with other negative pictures. It would be interesting to conduct a similar study, though distinguishing between the two kinds of negative pictures in order to obtain further insight into which kind of negative stimuli initiate stronger reaction based on a hypothesis that bloody pictures elicit higher arousal. A study of this topic would, though, demand quite a larger sample of participants.

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