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Pleasure, Arousal, Dominance: Mehrabian and Russell revisited

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Abstract

This paper presents a discursive review of the dimensions pleasure, arousal and dominance that Mehrabian and Russell developed in 1974 to assess environmental perception, experience, and psychological responses. Since then numerous researchers applied these dimensions to assess the experience of the physical environment and its perceived qualities. Although the dimensions appeared to be useful, there is a long-lasting debate going on among environmental psychologists about the interpretation of pleasure, arousal and dominance and its underlying mechanisms. Due to the lack of clarity researchers use different adjectives to describe environmental experiences, which makes any comparison between research findings difficult.

This paper shows that the three dimensions can be linked to the current ABC Model of Attitudes: pleasure, arousal and dominance can be respectively related to affective, cognitive and conative responses, i.e. Affect, Cognition and Behaviour (ABC). In addition, connecting the three dimensions to the triad feeling, thinking and acting, can also help to improve our understanding, interpretation and measurement of pleasure, arousal and dominance. Based on this review, it is proposed to re-introduce the three dimensions and to replace the nowadays often used two dimensional model with pleasure and arousal by a three dimensional model, including dominance as a third dimension, to represent the complete range of human responses.

Keywords: pleasure, arousal, dominance, ABC psychology, tripartite view of feeling, thinking, acting, experience

1. Introduction

An often applied approach to assess and describe environmental experiences is the environmental psychology method of Mehrabian and Russell (1974). They use three emotional dimensions - pleasure, arousal and dominance - to describe human perceptions of physical environments. In the last four decades, pleasure, arousal and to a lesser extent dominance have been used and are still used by numerous researchers in the field of environmental psychology (Bellizi, 1983; Bradley, 1992; Baker, 1992; Donovan, 1994; Dubé, 1995; Berleant, 1997; Floyd, 1997; Eastman, 1997; Kaplan et al., 1998; Wirtz, 2000; Mattila, 2001; Chebat, 2003; Stamps, 2003; Bigné, 2005; Laroche, 2005; Ryu, 2007; Arifin, 2007; Kuppens, 2008; van Hagen, 2009; Morisson, 2011; Hyun, 2011). Pleasure and arousal are also applied in other disciplines such as the neurological and neuropsychological sciences (Bradley, 1992; Bonnet, 1995; Costa, 2010; Walter, 2011), marketing research (Menon, 2002; Laroche, 2005; Wu, 2008; Lin, 2010; Ha, 2010; Penz, 2011), computer systems (Palacios, 2011) and psychological research (Reisenzein, 1994; Bradley, 2008).

In the field of environmental psychology, pleasure, arousal and dominance are conceived as three basic dimensions of emotional responses that indicate peoples' state of feeling (Mehrabian and Russell, 1974; Russell, 1980; Russell and Pratt, 1980; Zajonc, 1980; Russell, Ward and Pratt, 1981; Bell et al., 2001; Gifford, 2001). However, since 1974 discussions are going on among (environmental)

psychologists such as Russell, Ward, Pratt, and Lanius (1980, 1981, 1984, 1989, 1999, 2003) and Zajonc (1984) about the exact interpretation of the dimensions in connection to cognition and affect and the role of dominance. Whereas based on a critical review of the literature including findings from recent studies conducted in England and Venezuela Yani-de-Soriano & Foxall (2006) show that dominance is as legitimate an environmental descriptor as pleasure and arousal, in much research less attention is paid to dominance or even not at all (Russell, 1980; Russell, Ward and Pratt, 1981; Chebat, 2003; Mattila and Wirtz, 2006; Kuppens, 2008). In these studies models are used (see for example figure 1) with two axes: horizontally the degree of pleasure and vertically the degree of arousal.

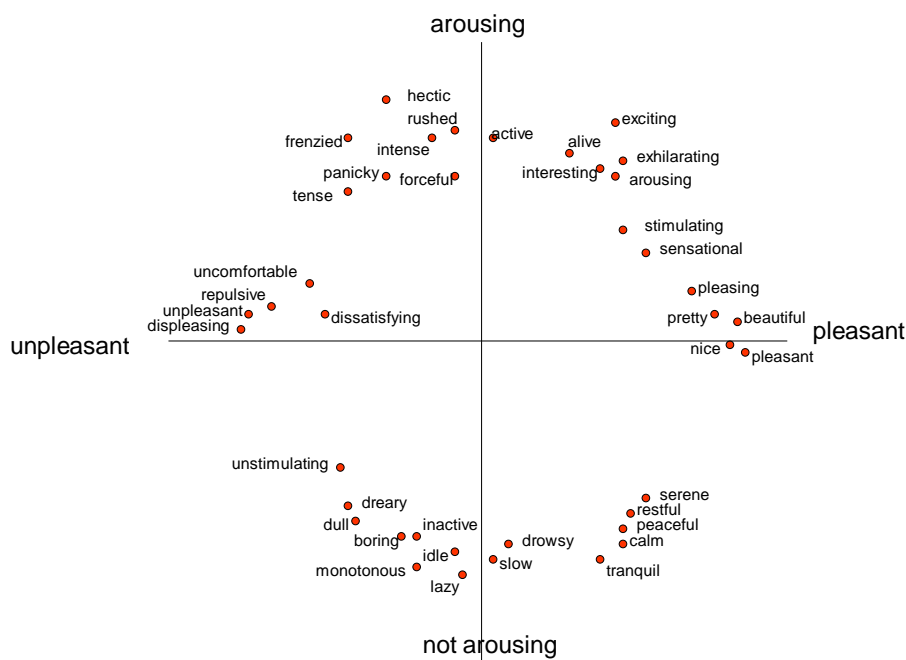


Figure 1: Example of an environmental psychology model with two axes that shows various adjectives to indicate the level of pleasure (X-axis) and arousal (Y-axis) (Russell & Lanius, 1984).

2. Pleasure, Arousal and Dominance revisited

In the literature a huge variety of different adjectives is used to operationalise pleasure, arousal and dominance. This makes research findings about the experience and perception of the physical environment difficult to compare. In order to gain a better understanding of the three dimensions, this paper analyses various adjectives related to pleasure, arousal and dominance that were applied by Mehrabian and Russell and other authors. Furthermore this paper explores the underlying mechanism in connection to the ABC Model of Attitudes i.e. a tripartite view with the three indicators affect, behaviour and cognition. As such it tries to answer the following questions:

1. What were the original operationalization's of pleasure, arousal and dominance defined by Mehrabian and Russell in 1974?
2. How are pleasure, arousal and dominance being applied by other researchers?
3. What are the main causes for different applications?
4. Which underlying mechanisms and psychological phenomena can be found to improve our understanding of pleasure, arousal and dominance?

3. Interpretations by Mehrabian and Russell (1974)

Mehrabian and Russell introduced pleasure, arousal and dominance as three independent emotional dimensions to describe people’s state of feeling. They conceived pleasure as a continuum ranging from extreme pain or unhappiness to extreme happiness and used adjectives such as happy – unhappy, pleased-annoyed, and satisfied-unsatisfied to define a person’s level of pleasure. Arousal was conceived as a mental activity describing the state of feeling along a single dimension ranging from sleep to frantic excitement and linked to adjectives such as stimulated-relaxed, excited- calm and wide awake-sleepy to define arousal. Dominance was related to feelings of control and the extent to which an individual feels restricted in his behaviour. To define the degree of dominance Mehrabian and Russell used a continuum ranging from dominance to submissiveness with adjectives such as controlling, influential and autonomous. Mehrabian (1996) mentioned the noun ‘relaxation’ as indicator for all three dimensions pleasure, arousal and dominance.

4. Comparison with the factors mentioned by Osgood et al.

Mehrabian and Russell (1974) compared the three dimensions pleasure, arousal and dominance with the three factors evaluation, activity and potency used by Osgood, Suci and Tannenbaum (1957) and Osgood (1963)(see Table 1). The first scientists who used these three factors were Solomon (1954) in analysing sonar signals and Tucker(1955) in his experiments judging paintings. Whereas both triads show some similarities, some dissimilarities come to the fore as well.

Table 1: Relationships between the three dimensions used by Mehrabian & Russell and the three factors used by Osgood

Three dimensions mentioned by Mehrabian & Russell (1974)	Three factors mentioned by Osgood et al. (1957)
Pleasure	Evaluation
Arousal	Activity
Dominance	Potency

Pleasure <-> Evaluation

Mehrabian and Russell described pleasure purely in terms of positive or negative feelings. The evaluation factor applied by Osgood *et al.* (1957) is quite ambiguous. It is based on factor-analysis and linked to a broad spectrum of adjectives such as good-bad, optimistic-pessimistic, positive-negative, complete-incomplete and timely-untimely . Twenty years after their first joint paper on this issue, Mehrabian (1996) operationalised pleasure in a rather different way and used connotations such as excitement, relaxation, love, and tranquillity versus cruelty, humiliation, disinterest and boredom. Table 2 shows different interpretations of pleasure according to Mehrabian and Russell. The number of different interpretations in the literature of the term ‘pleasure’ is smaller rather than the terms ‘arousal’ and ‘dominance’.

Table 2: Interpretations of pleasure by Mehrabian and Russell

Pleasure	
affective (emotional) responses	Mehrabian and Russell, 1974
affective (emotional) responses	Russell and Mehrabian, 1977
pleasantness-unpleasantness is analogous to the semantic differential dimension of evaluation	Russell and Mehrabian, 1977
pleasure is a continuum ranging from extreme pain or unhappiness at the one hand to extreme happiness or exstasy at the other end.	Russell and Mehrabian, 1977
positive versus negative affective states (e.g. excitement, relaxation, love, and tranquility versus cruelty, humiliation, disinterest, and boredom)	Mehrabian, 1996

Arousal <-> Activity

Although Mehrabian and Russell (1974) conceived arousal as a feeling state, they applied primarily adjectives that concern mental activity. In 1977 they described arousal as ranging from sleep and intermediate states of drowsiness and alertness to frenzied excitement. However, in 1996 Mehrabian defined arousal as a combination of mental alertness and physical activity. He operationalised arousal by using adjectives ranging from sleep, inactivity, boredom and relaxation at the lower end to wakefulness, bodily tension, strenuous exercise and concentration at the high end. Osgood (1957) defined activity as attention and used adjectives such as fast-slow, active-passive, excitable-calm, hot-cold. In his vision activity has also 'some relation to physical sharpness or abruptness as well' (see also Osgood, 1963). As such, Osgood used the activity factor for different types of activity, varying from physiological activity and mental activity to physical activity. Other authors used the activity factor in their research as well, with different interpretations (e.g. Lindsley, 1951; Duffy, 1957; Berlyne, 1966, 1970; Thayer, 1967; Bellizi, 1983; Mano, 1992; Bigné, 2005; Ryu, 2007). Lindsley (1951) and Duffy (1957) conceived activity as a physiological activity. Berlyne (1966, 1970) linked activity to attentiveness and connected activity to the arousal potential, known as the Wundt curve of 1874. This arousal potential concerns all types of stimulus properties that tend to raise alertness. Thayer (1967) used adjectives such as wide awake, aroused, aflame, impassioned, alert, and roused. Mano (1992) also related arousal to capacity. Table 3 shows different interpretations of pleasure by different researchers.

Table 3: Interpretations of arousal by different researchers

Arousal	
Wundt curve (1874) showing the arousal potential related to novelty and complexity (in Berlyne, 1970)	Wundt (1874)
arousal connected to attentiveness; relation between arousal and exploratory activities evoked by novel, complex and ambiguous stimuli. Animal's arousal level concerns wide-awake, attentive, excited.	Berlyne, 1966
arousal described in terms such as: wide awake, aroused, aflame, impassioned, alert, roused.	Thayer, 1967 in Russell, 1979
arousal related to novelty and complexity as hedonic value based on the Wundt curve	Berlyne, 1970
activity factor	Mehrabian and Russell, 1974
initially proposed to account for the intensity, but not the quality or direction, of a behavior	Mehrabian and Russell, 1974
feeling state varying along a single dimension ranging from sleep to frantic excitement such as stimulated, relaxed, excited and sleepy	Mehrabian and Russell, 1974
affective (emotional) responses	Russell and Mehrabian, 1977
the arousal dimension is analogous to the semantic differential dimension of activity	Russell and Mehrabian, 1977
responsiveness	Russell and Mehrabian, 1977
Arousal ranges from sleep through intermediate states of drowsiness and then alertness to frenzied excitement at the opposite extreme.	Russell and Mehrabian, 1977
relation with attentional capacity	Mano, 1992
level of mental alertness and physical activity. (e.g. sleep, inactivity, boredom, and relaxation at the lower end versus wakefulness, bodily tension, strenuous exercise, and concentration at the higher end).	Mehrabian, 1996
activity or activation	Russell and Carroll, 1999
arousal items: active, alert, attentive, excited.	Russell and Carroll, 1999

Dominance <-> Potency

Mehrabian and Russell (1974) connected dominance to feelings of control and behaviour restrictions caused by physical or social barriers. The adjectives they used to indicate a person's level of dominance - controlling, influential, autonomous - are different from the adjectives used by Osgood (1957) who described the potency factor by adjectives such as hard-soft, heavy-light, masculine-feminine, severe-lenient, strong-weak, tenacious-yielding. Thayer (1967) used potency in the same way as Osgood did. In 1996 Mehrabian interpreted dominance also in line with Osgood but he used different adjectives such as anger, relaxation, power and boldness versus anxiety, infatuation, fear and loneliness. Table 4 shows different interpretations of dominance according to different researchers.

Table 4: Interpretations of dominance by different researchers

Dominance	
Dominance described as dominant, controlling, influential, important, autonomous; submissiveness described as: submissive, controlled, influenced, awed, guided (in Russell, 1979)	Thayer, 1967
connected to behavior such as controlling, influential, autonomous	Mehrabian and Russell, 1974
potency	Russell and Mehrabian, 1977
ranges from feelings of total lack of control or influence on events and surroundings to the opposite extreme of feeling influential and in control.	Russell and Mehrabian, 1977
a third factor is not only dominance, but a number of dimensions such as locus of causation, importance of the emotion, and locus of control. These dimensions are interpretable as cognitive rather than affective (in Russell	Russell 1978
perceptual cognitive dimension	Russell, Pratt, 1980
perceptual cognitive dimension	Russell, Ward, Pratt, 1981
a feeling of control and influence over one's surroundings and others versus feeling controlled or influenced by situations and others (e.g., anger, relaxation, power, and boldness versus anxiety, infatuation, fear, and loneliness).	Mehrabian, 1996

5. Reflections on possible causes of different applications and interpretations

The different applications and interpretations might be due to different ideas about how people perceive and assess their environment and how this is expressed in their individual internal representations. A third issue that points out to differences between the three dimensions of Mehrabian and Russell and the three factors of Osgood et al. can be found in different levels of explained variance.

a. Affect and cognition

Russell, Ward, Pratt and Lanius (1980, 1981, 1984, 1989, 1999, 2003) and Zajonc (1984) conceived pleasure and arousal as indicators of affect, and considered dominance to be a more cognitive indicator (Russell, Pratt, 1980; Russell, Ward, Pratt, 1981). In environmental psychology research affect is a central theme (Russell and Pratt, 1980; Baker, 1992; Ang, 1997; Chebat, 2003; Ryu, 2007). According to Ulrich (1983), *"Affect is central to conscious experience and behaviour in any environment, whether natural or built, crowded or unpopulated. Because virtually no meaningful thoughts, actions, or environmental encounters occur without affect"*. In addition, the cognitive component is of considerable value in experiencing the physical environment as well, because a building has a function and a meaning with a cognitive recognition (Ittelson, 1973; Russell and Pratt, 1980; Russell, 1980; Russell, Ward and Pratt, 1981). Mehrabian (1996) used the term 'disinterest' as a noun to explain pleasure. This term concerns primarily a mental effect that is related to cognition. In 1974 Mehrabian and Russell described arousal as a mental activity in terms of 'a dimension ranging from sleep to frantic excitement'. Due to their references to Berlyne (1966, 1970) and Thayer (1967) and the adjectives Mehrabian and Russell used, such as stimulated, excited and wide awake, it can be concluded that arousal refers to a cognitive and not to an affective factor. This is in contrast to their original description of arousal as a state of feeling, but in accordance to the mental terms Mehrabian and Russell used in 1977, namely responsiveness and alertness. Mehrabian and Carroll (1999) linked 'activity' to adjectives such as alert, attentive and excited which are all focused on mental activity and as such refer to a cognitive response. Arousal explained by nouns such as attentiveness, awakens and alertness has also to be conceived as a mental processor and a

cognitive factor that may contribute to physiological activity. Whereas Mehrabian and Russell (1974) interpreted arousal as an affective factor, it shows to be a cognitive one that can be connected with thinking and thoughts. Regarding dominance, it can be questioned whether dominance has to be conceived as affective or cognitive, and how to measure this dimension (Russell and Pratt, 1980; Russell, Ward and Pratt, 1981). In the literature dominance is consequently related to freedom or limitations regarding someone's behaviour. This means that dominance is neither affective, nor cognitive, but conative.

b. Stimulus or response

The dimensions pleasure, arousal and dominance used by Mehrabian and Russell describe the state of feeling of the observer and as such concern a response, whereas the factors evaluation, activity and potency used by Osgood concern a judgment of the appearance of the (physical) environment and as such represent a stimulus. For instance the evaluation factor of Osgood represents a rather evaluative and contemplative dimension and values the positive and negative characteristics of the stimulus. This means that evaluation and pleasure can be considered as different terms with different interpretations. Mehrabian and Russell (1974) linked arousal to mental activity ranging from sleepy to excited, while Osgood described activity with stimulus characteristics such as fast-slow and warm-cold, and physical aspects such as sharpness or abruptness. Mehrabian and Russell (1974) used the dimension dominance to express the degree of restriction of behaviour i.e. to responses, whereas Osgood did not directly link his potency factor to behaviour but interpreted potency as a factor to describe aspects of general nature like hard-soft and heavy-light. As a consequence, dominance and potency are not comparable as well. Later on, Russell, Ward and Pratt (1981) considered dominance also as more related to the stimulus.

c. Different levels of explained variance

A third indication of incomparability between Mehrabian and Russell and Osgood et al. can be found in the different proportions of variance. According to Russell and Pratt (1981), both pleasure and arousal account for a large proportion of variance, whereas dominance showed a small percentage of explained variance (Russell, 1980; Russell and Pratt, 1980; Russell, Ward and Pratt, 1981). This might be due to the fact that dominance was not clearly interpreted and defined by an unclear mix of adjectives. Due to the low contribution to explained variance, many researchers do not pay attention to the influence of the dominance dimension. However, Osgood mentioned 'evaluation accounting for approximately double the amount of variance than potency or activity, these two in turn being approximately double the weight of any subsequent factors'. Apparently, potency did not have a low proportion of explained variance, whereas dominance did. It thus can be concluded that potency and dominance are different dimensions. Overall it can be concluded that serious differences exist between the triple pleasure, arousal and dominance and the triple evaluation, activity and potency.

6. In search of underlying mechanisms of pleasure and arousal

In order to be able to understand the relationship between environmental characteristics (stimuli) and the way people experience these characteristics (responses) and to clarify what actually happens in the mental processes between stimuli and response, this section discusses possible underlying mechanisms of pleasure and arousal. Figure 2 shows a diagram that is often used to valuing the physical environment by the dimensions pleasure and arousal (Russell, 1979; Russell, 1980; Mano, 1992; Barrett and Russell, 1998; Knez, 2002) Our assumption is that the centre (the grey square)

represents the conditions which people experience as harmonious. The outside area shows the area of disharmony, whereas the area in between shows the transition zone. A very low degree of pleasantness will cause feelings of disharmony; whereas too much pleasantness may also cause feelings of disharmony as people get lazy and bored without any challenges (Soesman, 2005). A very low degree of arousal makes people feel drowsy and a very high degree of arousal makes them highly agitated (Kandel, 2000).

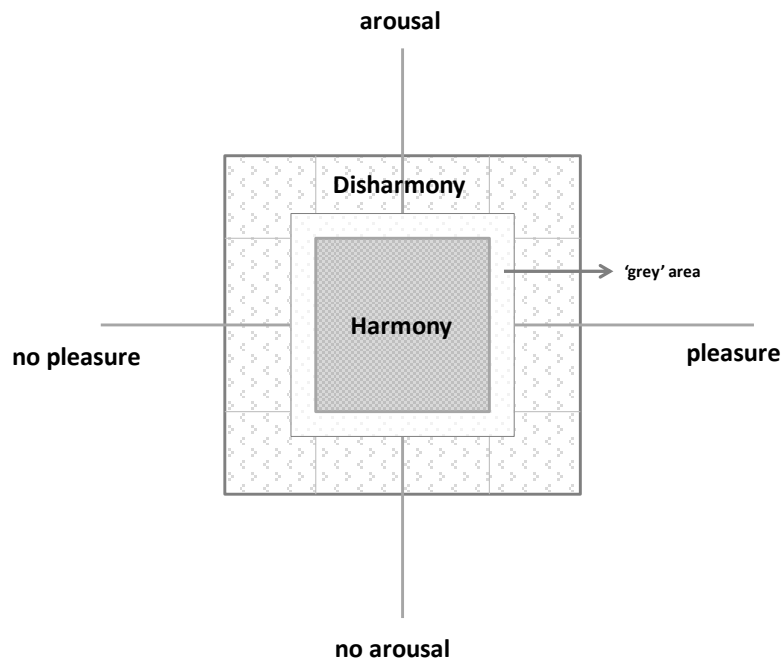


Figure 2: Pleasure and arousal as indicators for harmony and disharmony in the physical environment (Bakker and de Boon, 2012)

An underlying mechanism to explain pleasure and arousal might be the degree of order and variation. Regarding the environment, anthropologists make a distinction between the 'planet' which is shaped by natural forces and the 'world' which is built by human effort (Csikszentmihalyi, 1981). Both in the planet and the world an identical phenomenon can be observed: living creatures and man-made things can be recognized although all creatures and things are unique. Every oak for instance is unique and a particular building always differs from any other building. They both belong to a particular concept or archetype with a particular order (Goethe, 1810; Bortoft, 1996). Due to these concepts recognition is possible. We recognize any oak as an oak and we recognize any building as a building. Within these concepts, variations occur, both in planet and in world, which results in different appearances of the concepts caused by specific conditions and contexts. For the planet for instance, every oak shows a unique appearance while all features of this particular oak can be attributed to the oak concept. Also in the world due to the existence of concepts, recognition is possible as for instance the concepts of the old Egypt or the Islam, while the appearances of a particular Egyptian pharaoh image or a specific Islamite mosque all are unique. It can be concluded that the physical environment comes up with two characteristics: order based on concepts and variations as a result of unique conditions and contexts. The way we experience the environment depends on the degree of order and variation (Van Wegen, 1970; Steffen, 1980).

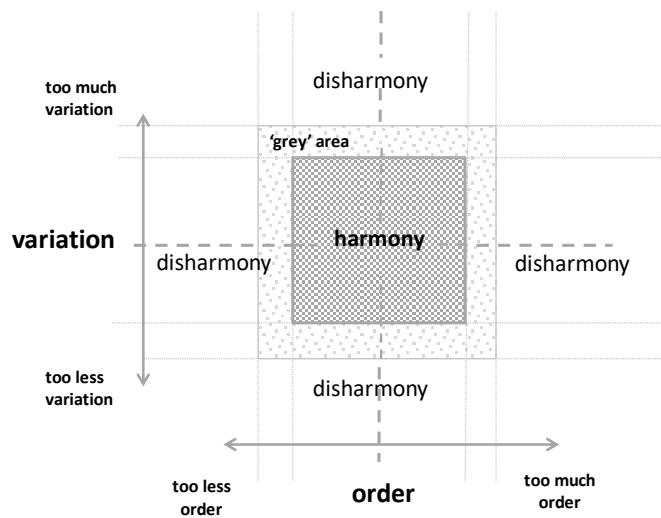


Figure 3: The degree of order and variation as indicators for harmony and disharmony in the physical environment (Bakker and de Boon, 2012)

Figure 3 shows the degree of order (horizontal axis) and variation (vertical axis) in connection to the experience of harmony and disharmony. An environment with a well-balanced level of order and variation (the grey square in figure 3) will be experienced as an harmonious environment (van Eyck, 1962). The outside area shows the area of disharmony: a too low degree of order means chaos, whereas too much order means rigidity (Schneider, 1987). A low degree of variation evokes dullness and a high degree means overstimulation. The area in between shows the transition zone. Although the axes in figure 2 and 3 are different, both grey squares represent a positive response. Our assumption is that judgments of individuals regarding degrees of dominance and arousal can be linked to the degree of order and variation of the physical environment. If this assumption is true, the level of order and variation can explain why people get pleased and how the feeling state of the observer is influenced by environmental features.

Another psychological phenomenon that influences pleasure and arousal are our expectations (Steffen, 1972; Wilson, 1989; Vonk, 2003). Expectations can also be related to order and variation. During a lifetime people get accustomed to concepts and people build up recognitions which form people's expectations. Psychological evidence shows that affect induces when people recognize things even when they are not aware of their recognitions (Zajonc, 2001). Deviations of expectations lead to arousal (Vonk, 2003). A positively experienced deviation leads to pleasure and a negatively experienced deviation leads to displeasure (Vonk, 2003). It is hypothesized that expectations are connected with learnt habits and mental representations (Vonk, 2003) and behaviour and as such are connected to the dimension dominance.

7. Connections with general theories in psychology

In 1960 Rosenberg and Hovland developed the so-called ABC-psychology that adds behaviour as a third dimension, in addition to affect and cognition. This tripartite view includes behaviour as a conative dimension (Allport, 1940; Wolff, 1980; Hilgard, 1980; Baumgarten, 1980; Arriaga et al, 2001; Gerdes, et al, 2008). Since then, many authors pay attention to the interrelated role of affect, cognition and behaviour (Ostrom, 1969; Breckler, 1984; Knopf, 1987; Fiedler et al, 1988; Polivy, 1998; Gabriel et al, 1999; Thompson, 1999; Farley et al, 2003; Stangor, 2013). The ABC psychology demonstrates a strong affinity with the three functions of the soul that were already mentioned by Plato: feeling, thinking and acting. The distinction between feeling, thinking and acting is used since a long time until nowadays as a common view on psychological experience, e.g. by Wolff (17th century); Baumgarten (18th century), Bain (19th century), Allport (1940), Smith (1947), Harding et al. (1954), Katz and Stotland (1959), Rosenberg et al, (1960b), Ostrom (1969), Brodwin (1976), Ajzen (1988), Hilgard (1980), Breckler (1984), Kay (1993), Arriaga et al. (2001), Jorgensen and Stedman (2001), van de Grindt (2004), Sno (2008), and Gerdes et al. (2008). According to this view, people show three types of responses while interacting with stimuli: affect, behaviour and cognition (ABC factors). These experiences lead to feelings, thoughts and/or acting (Ostrom, 1969; Brodwin, 1976; Schneider, 1987; Ajzen, 1988; Kay, 1993; Arriaga et al, 2001; van de Grindt, 2004; Covey, 2005; Smidts, 2002; Csikszentmihalyi, 1999). Asking people about their experiences results in expressions such as verbal statements of affect, perceptual responses and verbal statements of belief (cognition) and reports of behavioural intentions and commitment (Ostrom, 1969; Jorgensen and Stedman, 2001).

The ABC trilogy shows similarities with the three response dimensions of Mehrabian and Russell. Pleasure corresponds with affect. Arousal appeared to express cognition. When dominance is interpreted as Mehrabian and Russell originally did, dominance refers to the degree in which people experience their environment as being restrictive versus supporting to the way they want to act, their drives and their behaviour. As such, dominance represents a conative dimension, a term that Mehrabian and Russell did not use. Table 5 shows the relationships between the original three dimensions of Mehrabian and Russell (1974), the three factors of Osgood et al. (1957), the ABC psychology and the three functions of the souls according to Plato.

Table 5: Connections between the three dimensions of Mehrabian & Russell, the three factors of Osgood, the tripartite ABC-psychology and the triad mentioned by Plato

Three dimensions mentioned by Mehrabian & Russell to describe human responses	Three factors mentioned by Osgood to describe stimuli	ABC-psychology	Plato
Pleasure	Evaluation	Affect	Feeling
Arousal	Activity	Cognition	Thinking
Dominance	Potency	Behaviour (Conation)	Acting

8. Conclusion

This paper demonstrated that the original ideas of Mehrabian and Russell (1974) about pleasure, arousal and dominance can be connected to the ABC psychology and the distinction between feeling, thinking and acting that is used since ages and are still useful to describe environmental experiences. Both tripartite views bring us back to the first models in environmental psychology that included the dominance dimension as well, but now based on a better understanding of all three dimensions. For this reason it is suggested to replace the often used two dimensional model with pleasure on the horizontal axe and arousal on the vertical axe (see figure 1) by a three dimensional model with dominance on the third axe (see figure 4).

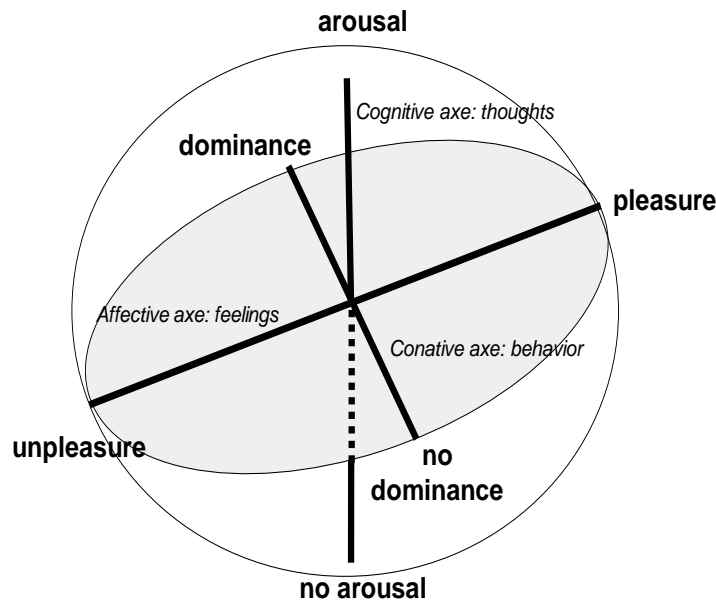


Figure 4: Three dimensional model of pleasure, arousal and dominance as tripartite view of experience (Bakker & de Boon, 2012)

Although different interpretations of pleasure, arousal and dominance can be found in literature, the original meanings developed by Mehrabian and Russell in 1974 are still valid. In future research pleasure and arousal have to be conceived as respectively affective and cognitive concepts. Regarding dominance, many researches showed the importance of feelings of control related to behaviour (Seligman, 1975; Frijda, 1988; Gaillard, 2003) and health (Johnson & Hall, 1988; Furda et al, 1994; Warr, 1994; Gaillard, 2003; De Lange et al, 2003; De Lange et al, 2004). These aspects were also mentioned by Karasek and related to workload and stress in his model together with Theorell in 1990 (in Gaillard, 2003). In research concerning topics such as picture processing (Bradley et al, 1994) or defining the effects in advertising (Morris et al, 2002) the dimension dominance plays an important role as well. It is recommendable that also in environmental psychology dominance is conceived as an influential factor which deserves serious attention and that this dimension will be rehabilitated. Additional research is needed to validate the proposed three-dimensional model. In current research a new list of adjectives is being tested on its applicability to measure the perceptual qualities of a meeting room (Bakker et al., forthcoming). The first findings confirmed the relevance of the triple pleasure, arousal and dominance.

References

Allport, G.W. (1940), The Psychologist's Frame of Reference. *Psychological Bulletin* 37, 1-28 in Hilgard, E.R. (1980), The trilogy of mind: Cognition, affection, and conation. *Journal of the History of the Behavioral Sciences*, 16 (2), 107–117.

Ajzen, I. (1989), Attitude, structure and behaviour, in Pratkanis, A.R., Breckler, S.J., Greenwald, A.G. (1989), *Attitude Structure and Function*. Lawrence Erlbaum Associates, Inc Publishers New Jersey.

Ang, S.H., Leong, S.M. (1997), The mediating influence of pleasure and arousal on layout and signage effects, comparing more and less customized retail services. *Journal of Retailing and Consumer Services*, 4(1), 13-24.

Arifin, S., Cheung, P.Y.K. (2007), A Computation Method for Video Segmentation Utilizing the Pleasure-Arousal-Dominance Emotional Information. Proceedings of the 15th international conference on Multimedia, 68-77.

Arriaga, X.B., Agnew, Ch.R. (2001), Being Committed: Affective, Cognitive, and Conative Components of Relationship Commitment. *Pers Soc Psychol Bull*, 27, 1190-1203.

Bain, A. (1864), *The senses and the intellect*. 2e edition; London, Logman, Green, Longman, Roberts and Green.

Baker, J., Levy, M., Grewal, D. (1992), An Experimental Approach to Making Retail Store Environmental Decisions. *Journal of Retailing*, 68(4), 445-460.

Bakker, I.C., de Boon, J.C. (2012), *Zorg voor mens en omgeving, Het zintuig als maatstaf*, KCWZ, Utrecht, 84-89.

Bakker, I., Van der Voordt, T., Vink, P., De Boon, J. (forthcoming), *A framework to select adjectives for a uniform assessment of the physical environment*. Work in progress.

Barrett, L.F., Russell, J.A.(1998), Independence and Bipolarity in the Structure of Current Affect, *Journal of Personality and Social Psychology*, 74 (4),967-984.

Baumgarten, A.G. in Hilgard, E.R.(1980), The trilogy of mind: Cognition, affection, and conation. *Journal of the History of the Behavioral Sciences*, 16 (2), 107–117.

Bell, P. A., Greene, T. C., Fisher, J. D., Baum, A. (2001). *Environmental psychology* (5th ed.). Fort Worth, TX: Harcourt College Publishers.

Bellizi, J.A., Crowley, A.E., Hasty, R.W. (1983), The Effects of Color in Store Design. *Journal of Retailing*, 59 (1), 21-45.

Berkowitz, L. (1987), *Advances in experimental social psychology*, Vol 20, Academic Press Inc, London.203-251.

Berleant, A. (1997), *Living in the landscape: Towards an aesthetics of environment*. Lawrence, KS: University Press of Kansas.

Berlyne, D.E. (1966), Conflict and arousal. *Scientific American*, Inc, 82-87.

Berlyne, D.E. (1970), Novelty, complexity, and hedonic value. *Perception & Psychophysics*, 8 (5A), 279-286.

Bigné, J.E., Andreu, L., Gnoth, J. (2005), The theme park experience: An analysis of pleasure, arousal and satisfaction. *Tourism Management* 26, 833–844.

Bonnet, M., Bradley, M.M., Lang, P.J., Requin, J. (1995), Modulation of spinal reflexes: arousal, pleasure, action. *Psychophysiology*, 32(4), 367–372.

Bortoft, H. (2010), *The Wholeness of Nature, Goethe's ay off Science*, Floris Books, fourth printing, Edingburgh, 50-64.

Bradley, M.M., Greenwald, M.K., Petry, M.C., Lang, P.J. (1992), Remembering pictures: Pleasure and arousal in memory. *Journal of Experimental Psychology*, 18(2), 379-390.

Bradley, M. M., & Lang, P. J. (1994). Measuring emotion: the self-assessment manikin and the semantic differential. *Journal of behavior therapy and experimental psychiatry*, 25(1), 49-59.

Bradley, M.M., Miccoli, L., Esgrig, M.A., Lang, P.J. (2008), The pupil as a measure of emotional arousal and autonomic activation. *Psychophysiology*, 45(4), 602–607.

Breckler, S. J. (1984), Empirical validation of affect, behavior, and cognition as distinct components of attitude. *Journal of Personality and Social Psychology*, 47(6), 1191-1205.

Brodwin, M.G. (1976), Two Hundred Years of the Psychology of Attitude-2000 Years of Contributions, From Plato to Allport. Paper presented at the 56th *Annual Convention of the Western Psychological Association*. Los Angeles, California, April 8-11, 1976.

Canter, D. (1969), An intergroup comparison of connotative dimensions in architecture. *Environment and Behavior*, 1 (1), 37-48.

Chebat, J.C., Michon, R. (2003), Impact of ambient odors on mall shoppers' emotions, cognition, and spending: A test of competitive causal theories. *Journal of Business Research* 56, 529-539.

Colomo-Palacios, Casado-Lumbreras, Ch., R., Soto-Acosta, García-Crespo, A. (2011), Using the Affect Grid to Measure Emotions in Software Requirements Engineering. *Journal of Universal Computer Science*, 17(9), 1281-1298.

Costa, V.D., Lang, P.J., Sabatinelli, D., Versace, F., Bradley, M.M. (2010), Emotional Imagery: Assessing Pleasure and Arousal in the Brain's Reward Circuitry. *Human Brain Mapping* 31, 1446–1457.

Covey S.R.(2005), *De 8e eigenschap van effectiviteit naar inspiratie*, Uitgeverij Business Contact Amsterdam/Antwerpen.

Craik, K. H. (1971). The assessment of places. In P. McReynolds (ed.), *Advances in Psychological Assessment*, 2, 40-62. Palo Alto, Calif.: Science and Behaviour Books.

Csikszentmihalyi, M. (1999), *De weg naar Flow*. Boom Amsterdam, 38-41.

Csikszentmihalyi, M., Rochberg/Halton, E. (1981), *The meaning of things, Domestic symbols and the self*, Cambridge University Press, page 15.

De Lange, A.H., Taris, T.W., Kompier, M.A.J., Houtman, I. L.D., Bongers, P.M.(2003), The very best of the Millennium': Longitudinal research and the Demand-Control-(Support) Model. *Journal of Occupational Health Psychology*, 8, 282/305

De Lange, A. H., Taris, T. W., Kompier, M. A., Houtman, I. L., Bongers, P. M. (2004). The relationships between work characteristics and mental health: Examining normal, reversed and reciprocal relationships in a 4-wave study. *Work & Stress*, 18(2), 149-166.

Donovan, R.J., Rossiter, J.R., Marcoolyn, G., Nesdale, A. (1994). Store atmosphere and purchasing behavior, *Journal of Retailing*, 70(3), 283–294.

Dubé, L., Chebat, J.C., Morin, S. (1995), The effects of background music on consumers' desire to affiliate in buyer-seller interactions, *Psychology & Marketing*, 12(4), 305–319.

Duffy, E. (1957), The psychological significance of the concept of arousal or activation. *Psychological Review*, 64, 265-275 in Russell, J.A., Weiss, A., Mendelsohn, G.A. (1989), Affect Grid: A Single-Item Scale of Pleasure and Arousal. *Journal of Personality and Social Psychology*, 57(3), 493-502.

Eastman, S, T.(1997), Uses of television viewing and consumer life styles: A multivariate analysis. *Journal of Broadcasting*, 23(4), 491-500.

Farley, S.D., Stasson, M.F. (2003), Relative Influences of Affect and Cognition on Behavior: Are Feelings or Beliefs More Related to Blood Donation Intentions? *Experimental Psychology*, Vol. 50(1): 55- 62.

Fiedler, K. (1988), Emotional mood, cognitive style, and behavior regulation, in Fiedler, K. ,Forgas, J., (Eds.), (1988), *Affect, cognition and social behavior: New evidence and integrative attempts*. Toronto, Canada: Hogrefe.

Bakker, I., Van der Voordt, T., de Boon, J. & Vink, P., Pleasure, Arousal, Dominance: Mehrabian and Russell revisited. *Current Psychology*. 33(3), 405-421. DOI 10.1007/s12144-014-9219-4 Online ISSN 1936-4733

Fiedler, K., Forgas, J., (Eds.), (1988), *Affect, cognition and social behavior: New evidence and integrative attempts*. Toronto, Canada: Hogrefe.

Floyd, M.F. (1997), Pleasure, arousal, and dominance: Exploring affective determinants of recreation satisfaction, *Leisure Sciences, Leisure Sciences: An Interdisciplinary Journal*, 19(2), 83-96.

Frijda, N.H. (1988), *De emoties*. Amsterdam, Bert Bakker.

Furda, J., Jonge, J. de, Blanc, P. le, Meijman, T., Scheurs, P., Scheenen, J.(1994), Het demand-control-support model in relatie tot gezondheidsklachten en herstelklachten. *Gedrag en Organisatie*, 7, 225-237.

Gabriel, S., Gardner, W.L. (1999), Are there "his" and "hers" types of interdependence? The implications of gender differences in collective versus relational interdependence for affect, behavior, and cognition. *Journal of Personality and Social Psychology*, Vol 77(3), 642-655.

Gaillard, A.W.K. (2003), *Stress, productiviteit en gezondheid*, second edition, Uitgeverij Nieuwezijds, Amsterdam.

Gerdes, K.E., Stromwall L.K. (2008), Conation: a missing link in the strengths perspective. *Soc Work*, 53(3):233-42.

Gifford, R. (2001), *Environmental psychology, principles and practice*. Allyn and Bacon, third edition, Boston.

Goethe, J.W. (1981), *De metamorfose van de planten, Inleiding en toelichtingen van Rudolf Steiner*, Uitgeverij Christofoor, Rotterdam, 7,8, 13.

Ha, Y., Lennon, S.J. (2010), Online Visual Merchandising (VMD) Cues and Consumer Pleasure and Arousal: Purchasing versus Browsing Situation. *Psychology & Marketing*, 27(2), 141–165.

Harding, J., Kutner, B., Proshansky, H., CHEIN, I. Prejudice and ethnic relations. In Ostrom, T. M. (1969). The relationship between the affective, behavioral, and cognitive components of attitude. *Journal of Experimental Social Psychology*, 5(1), 12-30.

Hilgard, E.R.(1980), The trilogy of mind: Cognition, affection, and conation. *Journal of the History of the Behavioral Sciences*, 16 (2), 107–117.

Hyun, S.S., Wansoo, K., Myong J.J. (2011), The impact of advertising on patrons' emotional responses, perceived value, and behavioral intentions in the chain restaurant industry: The moderating role of advertising-induced arousal. *International Journal of Hospitality Management*, 30(3), 689–700.

Isen, A.M. (1987), Positive affect, Cognitive processes, and social behavior in Berkowitz, L. (1987), *Advances in experimental social psychology*, Vol 20, Academic Press Inc, London.203-251.

Ittelson, W.H. (1973), *Environment and Cognition*, Seminar Press, Oxford, England.

Johnson, J.V., Hall, E.M. (1988), Job strain, workplace social support, and cardiovascular disease: a cross sectional study of a random sample of the Swedish working population. *American Journal of Public Health*, 78, 1336-1342.

Jorgensen, B.S., Stedman, R.C.(2001), Sense of Place an Attitude: Lakeshore owners attitudes toward their properties. *Journal of Environmental Psychology*, 21(3), 233-248.

Kandel, E.R., Schwartz, J.H., Jessell, Th.M. (2000), *Principles of Neural Science*, The MacGraw-Hill Companies, Fourth Edition, United State of America, 414, 982-986.

Kaplan, R., Kaplan, S., Ryan, R.L. (1998), *With people in mind: Design and management of everyday nature*. Washington, DC: Island Press.

Katz, D., Stotland, E. (1959). A preliminary statement to a theory of attitude structure and change. In Ostrom, T. M. (1969). The relationship between the affective, behavioral, and cognitive components of attitude. *Journal of Experimental Social Psychology*, 5,(1) 12-30.

Kay, R.H.(1993), An Exploration of Theoretical and Practical Foundations for Assessing Attitudes Toward Computers: The Computer Attitude Measure (CAM). *Computers in Human Behavior*, 9 (4), 371-386.

Knopf, R. (1987), Human behavior, cognition, and affect in the natural environment in Stokols, D., Altman, I.(1987), *Handbook of environmental psychology.*, New York: Wiley.

Kuppens, P. (2008), Individual differences in the relationship between pleasure and arousal. *Journal of Research in Personality*, 42(4), 1053–1059.

Laroche, M., Teng, L., Michon, R., Chebat, J.C.(2005), Incorporating service quality into consumer mallshopping decision making: a comparison between English and French Canadian consumers. *Journal of Services Marketing*, 19(3), 157–163.

Lin, I.Y. (2010), The interactive effect of Gestalt situations and arousal seeking tendency on customers' emotional responses: matching color and music to specific servicescapes. *Journal of Services Marketing*, 24 (4),294 – 304.

Lindsley, D. B. (1951), Emotion, in Russell, J.A., Weiss, A., Mendelsohn, G.A. (1989), Affect Grid: A Single-Item Scale of Pleasure and Arousal. *Journal of Personality and Social Psychology*, 57, no 3, 493-502.

Mattila, A.S., Wirtz, J. (2001), Congruence of scent and music as a driver of in-store evaluations and behaviour. *Journal of Retailing*, 77 (2), 273–289.

Bakker, I., Van der Voordt, T., de Boon, J. & Vink, P., Pleasure, Arousal, Dominance: Mehrabian and Russell revisited. *Current Psychology*. 33(3), 405-421. DOI 10.1007/s12144-014-9219-4 Online ISSN 1936-4733

Mattila, A.S., Wirtz, J. (2006), Arousal expectations and service evaluations. *International Journal of Service Industry Management*, 17 (3), 229-244.

Mehrabian, A. (1996), Pleasure-Arousal-Dominance: A General Framework for Describing and Measuring Individual Differences in Temperament. *Current Psychology*, 14(4), 261- 292.

Mehrabian, A., Russell, J.A. (1974), *An Approach to Environmental Psychology*, The Massachusetts Institute of Technology, United States of America, 216-217.

Menon, S., Kahn, B. (2002), Cross-category effects of induced arousal and pleasure on the Internetshopping experience. *Journal of Retailing*, 78 (1), 31–40.

Morris, J. D., Woo, C., Geason, J. A., & Kim, J. (2002). The power of affect: Predicting intention. *Journal of Advertising Research*, 42(3), 7-18.

Morrison, M., Gan, S., Dubelaar, Ch., Oppewal, H. (2011), In-store music and aroma influences on shopper behavior and satisfaction. *Journal of Business Research* 64 (6), 558–564.

Osgood, Ch., Suci, G.J., Tannenbaum, P.H. (1957), *The measurement of meaning*, University of Illinois Press, Urbana, Chicago and London, 36, 38, 62, 63, 149, 185, 186, 325.

Osgood, Ch. E. (1963), Part four, Psychological approaches, Semantic Differential Technique in the Comparative Study of Cultures. *American Anthropologist*, 66 (3), 171-200.

Ostrom, T. M. (1969). The relationship between the affective, behavioral, and cognitive components of attitude. *Journal of Experimental Social Psychology*, 5 (1), 12-30.

Penz, E., Hogg, M.K.(2011), The role of mixed emotions in consumer behavior Investigating ambivalence in consumers' experiences of approach-avoidance conflicts in online and offline settings. *European Journal of Marketing*, 45 (1/2), 104-132.

Polivy, P. (1998), The Effects of Behavioral Inhibition: Integrating Internal Cues, Cognition, Behavior, and Affect, *Psychological Inquiry: An International Journal for the Advancement of Psychological Theory*, Vol 9(3), 181-204.

Reisenzein, R. (1994), Pleasure-Arousal Theory and the Intensity of Emotions. *Journal of Personality and Social Psychology*, 67 (3), 525-539.

Rosenberg, M.J., Hovland, C.I., McGuire, W.J., Abelson, .P., Brehm, J.W.(1960), *Attitude organization and change: an analysis of consistency among attitude components*, New Haven. Connecticut: Yale University

Rosenberg, M.J., Hovland, C.I.,(1960a), Cognitive, Affective and Behavioral Components of Attitudes, in Russell, H.F., Olson, M.A. (2003), *Attitudes: Foundations, Functions and Consequences*, The Sage Handbook of Social Psychology, M.A. Hogg & J. Cooper (eds), London, Sage, 139-160.

Bakker, I., Van der Voordt, T., de Boon, J. & Vink, P., Pleasure, Arousal, Dominance: Mehrabian and Russell revisited. *Current Psychology*. 33(3), 405-421. DOI 10.1007/s12144-014-9219-4 Online ISSN 1936-4733

Russell, J.A. (1980), A Circumplex Model of Affect. *Journal of Personality and Social Psychology*, 39 (6), 1161-1178.

Russell, J.A., Carroll, J.M. (1999), On the Bipolarity of Positive and Negative Affect. *Psychological Bulletin*, 125 (1), 3-30.

Russell, J.A., James, A.(2003), Core Affect and the psychological construction of emotion. *Psychological Review*, 110 (1), 145-172.

Russell, J.A., Lanius, U.F. (1984), Adaptation level and the affective appraisal of environments. *Journal of Environmental Psychology*, 4(2) 119–135.

Russell, J.A., Pratt, G.(1980), A description of the affective quality attributed to environments *Journal of Personality and Social Psychology*, 38(2), 311-322.

Russell, J.A., Ward, L.M. Pratt, G.(1981), Affective Quality Attributed to Environments A Factor Analytic Study. *Environment and Behavior*, 13 (3), 259-288.

Russell, J.A., Weiss, A., Mendelsohn, G.A. (1989), Affect Grid: A Single-Item Scale of Pleasure and Arousal. *Journal of Personality and Social Psychology*, 57 (3), 493-502.

Ryu, K., Jang, S.(2007), The effect of environmental perceptions on behavioural intentions through emotions: the case of upscale restaurants. *Journal of Hospitality & Tourism Research*, 31(1), 65-72.

Schneider, W. (1987), *Sinn und Un-Sinn, Umweltt sinnlich erlebbar gestalten in Architektur und Design*, Wiesbaden und Berlin: Bauverlag GMBH, 43, 106.

Seligman, M. (1975), Helplessness. *On depression, development and death*. San Francisco. Freeman.

Sno H.N. (2008), The psychiatric assessment and mental status examination from an EBM perspective. *Tijdschrift Psychiatrie*, 50(6), 353-8.

Smidts, A. (2002), *Kijken in het brein, Over de mogelijkheden van euromarketing*, Erasmus Research Institute of Management, Rotterdam.

Smith, M. B. (1947). The personal setting of public opinions: A study of attitudes toward Russia. *Public Opinion Quarterly*, 11, 507-523 in Kay, R.H.(1993), An Exploration of Theoretical and Practical Foundations for Assessing Attitudes Toward Computers: The Computer Attitude Measure (CAM). *Computers in Human Behavior*; 9 (4), 371-386.

Soesman, A. (2005), *De Twaalf zintuigen*, 4e druk, Vrij Geestesleven, Zeist

Solomon, L.N. (1954), *A factorial study of the meaning of complex auditory stimuli*, Unpublished doctoral dissertation, University of Illinois in Mehrabian, A., Russell, J.A. (1974), *An Approach to*

Bakker, I., Van der Voordt, T., de Boon, J. & Vink, P., Pleasure, Arousal, Dominance: Mehrabian and Russell revisited. *Current Psychology*. 33(3), 405-421. DOI 10.1007/s12144-014-9219-4 Online ISSN 1936-4733

Environmental Psychology, The Massachusetts Institute of Technology, United States of America, 216-217.

Stangor, Ch.(2013), *Affect, behavior, and cognition*, Principles of Social Psychology, Flat World Knowledge, Inc.

Stamps, A.E. (2003), Advances in visual diversity and entropy. *Environment and Planning B: Planning and Design*, 30, 449- 463.

Steffen, C. (1972). *Perceptieonderzoek en stedenbouw*. Delft, Technische Hogeschool Delft,rapport C.A. 72.05.01.

Steffen, C. (1980) *Psychologische aspecten van complexiteit*. Delft, Technische Hogeschool Delft,rapport C.A.80.10.01.

Stokols, D., Altman, I.(1987), *Handbook of environmental psychology* , New York: Wiley.

Thayer, R.E.(1967), Measurement of activation through self-report, *Psychological Reports* 20, 663-678 in Mehrabian, A., Russell, J.A. (1974), *An Approach to Environmental Psychology*, The Massachusetts Institute of Technology, United States of America, 216-217.

Thompson, L., Fine, G.A.(1999), Socially Shared Cognition, Affect, and Behavior: A Review and Integration, *Pers Soc Psychol Rev* , Vol 3(4), 278-302

Tucker, W.T. (1955), *Experiments in aesthetic communications*. Unpublished doctoral dissertation, University of Illinois in Mehrabian, A., Russell, J.A. (1974), *An Approach to Environmental Psychology*, The Massachusetts Institute of Technology, United States of America, 216-217.

Ulrich, S. R., (1983), Aesthetic and Affective Response to Natural Environment, *Behavior and the natural environment, Human Behavior and Environment*, Vol 6, 85-125

Van Eyck, A. (1962). De verkapte opdrachtgever en het grote woord 'neen'. *Forum* 16, 79-122 in Steffen, C. (1980) *Psychologische aspecten van complexiteit*. Delft, Technische Hogeschool Delft, rapport C.A.80.10.01.

Van de Grind, W. A. (2004). *Natuurlijke Intelligentie, over denken, intelligentie en bewustzijn van mensen en andere dieren*. Uitgeverij Nieuwezijds, Amsterdam.

Van Hagen, M., Galetzka, M, Pruyn, A., Peters J. (2009), Effects of Colour and Light on Customer Experience and Time Perception at a virtual Railway Station, *Proceedings Experiencing Light 2009; International Conference on the Effects of Light on Wellbeing*; 137-145.

Van Wegen, H.B.R. (1970), *De invloed van variatie op aandacht en waardering voor eenvoudige vormstructuren*. Delft, Technische Hogeschool Delft,rapport C.A. 70.01.03

Bakker, I., Van der Voordt, T., de Boon, J. & Vink, P., Pleasure, Arousal, Dominance: Mehrabian and Russell revisited. *Current Psychology*. 33(3), 405-421. DOI 10.1007/s12144-014-9219-4 Online ISSN 1936-4733

Vonk, R. (2003). *Cognitieve sociale psychologie*. Uitgeverij Lemma BV, Utrecht, 375-380.

Walter, S., Kessler, H., Gruss, S., Jerg-Bretzke, L., Scheck, A., Ströbel, J., Hoffmann, H., Traue, C. (2011). The influence of neuroticism and psychological symptoms on the assessment of images in three-dimensional emotion space. *Psychosoc Med* Published online 2011 June 6.

Warr, P.(1994), A conceptual framework for the study of work and mental health. *Work and Stress*, 8, 84-97.

Wilson, T.D., Lisle, D. J., Kraft, D., Wetzel, Ch. G. (1989), Preferences as expectation-driven inferences: Effects of affective expectations on affective experience. *Journal of Personality and Social Psychology*, 56(4), 519-530.

Wirtz, J., Mattila, A.S., Tan, R.L.P.(2000), The Moderating Role of Target-Arousal on the Impact of Affect on Satisfaction—An Examination in the Context of Service Experiences. *Journal of Retailing*, 76(3), 347–365.

Wolff, Ch. in Hilgard, E.R.(1980), The trilogy of mind: Cognition, affection, and conation. *Journal of the History of the Behavioral Sciences*, 16(2), 107–117.

Wu, Ch.S., Cheng, F,F, Yen, D.C.(2008), The atmospheric factors of online storefront environment design: An empirical experiment in Taiwan. *Information and Management*, 45 (7), 493-498.

Yani-de-Soriano M.M., Foxall G.R. (2006), The emotional power of place: the fall and rise of dominance in retail research, *J of Retailing and Consumer Services* 13(6):403-416.

Zajonc, R.B. (1980), Feeling and Thinking, Preferences Need No Inferences. *American Psychologist*, 35 (2), 151-175

Zajonc, R.B. and Markus, H. (1984), Affect and cognition: the hard interface, in Izard, C.E., Kagan, J., Zajonc, R.B. *Emotions, Cognition, and Behavior*, Cambridge University Press, 17, 73-102.

Zajonc, R.B. (2001), Mere exposure: A Gateway to the subliminal. *Current Directions in Psychological Science*, 10(60), 224-228.