



## Case Study

## Psychoneurobiochemistry of tourism marketing

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## ARTICLE INFO

## Article history:

Received 7 March 2013

Accepted 7 March 2014

## Keywords:

Psychoneurobiochemistry

Psychology

Physiology

Neurotransmitters

Tourism

Serotonin

Consumer behaviour

Neuromarketing

## ABSTRACT

This study offers a unique approach to consumer/tourist behaviour called psychoneurobiochemistry and aims to explore the possible and potential influences of psychoneurobiochemical factors on tourism marketing. The study with a multidisciplinary approach analyzes and synthesizes the psychological, neurological, biological and chemical research findings in terms of their implications for tourism marketing. The study particularly looks at neurotransmitters such as serotonin and dopamine; melatonin hormone; photoperiod and circadian rhythm and emotions.

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## 1. Introduction

Tourism is the largest industry in the world both in terms of the revenues generated and the number of people employed. Tourism industry's contribution to worldwide gross domestic product (GDP) and employment was 5% and 7% respectively in 2011 (WTO, 2012). In 2011 over one billion people participated in tourism activities generating an income of \$1030 billion (WTO, 2012). More importantly it is estimated that these figures have been reached with the involvement of only 4% of the whole world population participating in tourism activities. This means that the growth potential of tourism industry is phenomenal. It is estimated that in 2020 tourism industry will generate an income of \$2 trillion with the participation of 2.6 billion people.

Therefore, the studies tourism industry is important both on a macro level, in terms of its contribution to countries' economies, but also at micro level, i.e. at firm level, in terms of achieving competitive advantage. Based on this background this study through a multidisciplinary approach analyzes and synthesizes the psychological, neurological, biological and chemical research findings in terms of their implications for tourism marketing. The study

is important as in most research studies of consumer behaviour data collected from the participants are based on their own accounts and evaluations of consumption situations. However, in many instances, data collected through the accounts and evaluations of the participants may not reflect actual truth. This may be due to two factors. Firstly, the participants in research studies may have hidden motives, which even they themselves may not be aware of Koc (2013a). Secondly, in many instances people may engage in impression management, i.e. a goal-directed conscious or unconscious activity in which people attempt to influence the perceptions of others about a person, object or event through regulating and controlling information in social interaction (Goffman, 1959).

## 2. Psychoneurobiochemistry of tourism marketing

The term psychoneurobiochemistry has been coined by the authors of this study to refer to a group of often studied factors in the disciplines of psychology, neurology, biology and chemistry. These factors influence tourism consumers both in terms of their physiological and psychological existences. These two existences are intertwined, through a continuous interaction in which one influences the other. The physiological and psychological existences of consumers are analyzed and synthesized in this study by exploring neurotransmitters and hormones such as serotonin, dopamine and melatonin; biological factors such as photoperiod

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and circadian rhythm and psychological factors such emotions and mood.

### 2.1. Serotonin

In human brain information as a response to a stimuli, is communicated through neurotransmitters such as serotonin and dopamine (Artigas, Romero, de Montigny, & Blier, 1996; Graeff, Guimaraes, de Andrade, & Deakin, 1996; Griebel, 1995). A neurotransmitter, a brain chemical, communicates information throughout the human brain and body. A neurotransmitter (or synaptic transmitter) communicates information between neurons by the movement of chemicals or electrical signals across a synapse, a structure that permits a neuron (or nerve cell) to pass an electrical or chemical signal to another cell (neural or otherwise) (Gaspar, Cases, & Maroteaux, 2003; Gross et al., 2002; del Olmo et al., 1998).

Serotonin (5-HT), usually referred as the happiness hormone, is a neurotransmitter that influences a vital section of the brain, called the limbic system. The limbic system supports a variety of functions, including emotion, behaviour, motivation, long-term memory, and olfaction. Serotonin is primarily responsible for emotional life of human beings, and has a great deal to do with the formation of memories (Siegel, 2005).

There is plenty of research evidence, across many species including humans, suggesting that as the secretion (discharge) of serotonin decreases, the tendency to aggression increases (Pihl & LeMarquand, 1998; Siegel, 2005). Unusually low levels of serotonin are also associated with impulsive and erratic behaviours (Winstanley, 2007). Impulsive behaviour motivates consumers to seek immediate rewards, rather than choosing the “delayed” reward (or long term positive balance/need satisfaction) by having self-control (Bizot, Le Bihan, Puech, Hamon, & Thiebot, 1999). Therefore, impulsivity may lead to inappropriate or poor decision making as it favours immediate outcomes over delayed outcomes. Research shows that as much as 95% of all consumer purchases of products and services could be impulse purchases (Bayley & Nancarrow, 1998; Beatty & Ferrell, 1998; Bellenger, Robertson, & Hirschman, 1978; Cobb & Hoyer, 1986; Coley, 2002; Gutierrez, 2004; Kacen & Lee, 2002; Kollat & Willet, 1967; Parboteeah, 2005; Piron, 1991; Rook, 1987; Rook & Fisher, 1995; Solomon, 2003; Stern, 1962; Tendai & Crispin, 2009; Verplanken & Herabadi, 2001; Virvilaite, Saladiene, & Bagdonaite, 2009; Vohs & Faber, 2007).

The level of impulsivity of customers may be increased in purchasing environments through marketing stimuli, despite its ethical repercussions. In the tourism industry the servicescape (the physical surroundings) of hotels, restaurants, travel agencies and the marketing communications messages of all sorts, e.g. web sites, brochures, etc., may be designed in such a manner to encourage and induce customers to engage in reward seeking behaviour. In this way the potential of stimulation of the interaction with the servicescape and the atmosphere, and the potential of engaging in impulsive behaviour, can be triggered (Donovan & Rossiter, 1982; Hart & Davies, 1996; Oakes, 2000; Tai & Fung 1997; Verplanken & Herabadi, 2001).

Serotonin is synthesized in two stages from the dietary amino acid tryptophan. The first stage is catalyzed by the enzyme tryptophan hydroxylase. The low affinity of the enzyme for tryptophan makes this stage rate-limiting for serotonin synthesis – in other words, serotonin can be produced only as fast as this enzyme can hydroxylate tryptophan. The rate of serotonin synthesis is determined, in part, by the availability of tryptophan in the brain. If there is more tryptophan, there will be more tryptophan (Bear, Connors, & Paradiso, 1996). Therefore the dietary alterations of the serotonin precursor tryptophan can influence the levels of serotonin.

Tryptophan is a fundamental amino acid for the synthesis of protein, and it cannot be synthesized by the human organism and hence must be ingested in the diet. After an amount of the intake of tryptophan, the tryptophan is absorbed into the capillaries (minute blood vessels) in the intestinal wall. A small amount of the tryptophan remains free, while the majority of it (about 80%–90%) is transported bound to albumin through the blood and into the brain (Paredes, Barriga, Reiter, & Rodríguez, 2009). Research findings show that concentration of the amino acid tryptophan is significantly lower in psychologically depressed patients.

The level of the serotonin appears to play a major role in the generation and modulation of various cognitive and behavioural functions such as sleep, mood, pain, addiction, locomotion, sexual activity, depression, anxiety, alcohol abuse, aggression and learning (Artigas et al., 1996; Graeff, Guimaraes, de Andrade, & Deakin, 1996; Griebel, 1995; Meneses, 1999; Ramboz et al., 1998; Rocha et al., 1998). Additionally, failure in serotonergic systems cause of mental disorders such as schizophrenia, migraine, depression, suicidal tryptophan, infantile autism, eating disorders, and obsessive compulsive disorder (Heisler et al., 1998; Murphy, Wichems, Li, & Heils, 1999; Parks, Robinson, Sibille, Shenk, & Toth, 1998; Parsons, Kerr, & Tecott, 2001; Ramboz et al., 1998; Rocha et al., 1998), heart disease (Nebigil & Maroteaux, 2001), asthma (Barnes, Chung, & Page, 1998) and phagocytosis (Freire-Garabal et al., 2003).

Increasing tryptophan levels can increase serotonin synthesis as much as twofold (Young & Gauthier, 1981), while decreasing tryptophan availability can cause a substantial decline in serotonin synthesis and turnover (Carpenter, Nagell, & Tomasello, 1998; Nishizawa et al., 1997).

Moreover, the serotonin pathway plays an indispensable role in brain development processes such as neurogenesis and axonal branching during various stages of development (Gaspar et al., 2003; Gross et al., 2002; del Olmo et al., 1998). Measurement of serotonin levels during normal human aging has shown age-dependent decreases in certain, but not all, brain regions. Overall research findings relating to the level of serotonin and aging suggest that the level of serotonin in brain decreases with age (Ko, King, Gordon, & Crisp, 1997; Rehman & Masson, 2001). However, a distinction needs to be made in terms of the phases of aging as in the early to mid-phase of aging, the level of serotonin secretion in the brain increases (Cassel et al. 2005; Murakami, Bessinger, Hellmann, & Murakami, 2008; Sapolsky & Donnelly, 1985; Van Nueten & Janssens, 1986). During the late phase of aging, levels of serotonin are reduced due to the loss of the serotonin-secreting neurons (Mattson, Maudsley, & Martin, 2004). The increase of serotonin secretion in the brain in the early to mid-phase of aging is mainly to do with the relative inability to turn off cortisol production (Sapolsky & Donnelly, 1985). Hypothyroidism increases the formation of serotonin, as does cortisol (Henley, Meng, O'Brien, McCarthy, & Sockloskie, 1998; Neckers & Sze, 1975). This is why, in general, in the early phase of aging people feel less stressed and depressed. In the early to mid-phase of aging people become more tolerable towards things around themselves and be more satisfied with who they are and what they have (Koc, 2013a). This in turn may reduce the personality conflicts emanating from the gap between the actual and the ideal self-concepts of individuals.

Exposure to bright light can also trigger tryptophan, serotonin precursor, without the extra intake of drugs and food and beverages. Bright light is a standard treatment for seasonal depression, but a few studies also suggest that it is an effective treatment for nonseasonal depression and it also soothes the depressed mood (Carlsson, Svennerhold, & Winblad, 1980; Golden et al., 2005; Lam et al., 1999). It is known that while 90% of Finnish people experience seasonal affective disorders (Avery et al., 2001), only 10% of Italians experience seasonal affective disorders. Tourism and hospitality

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