Towards a Psychological Theory of Altered States of Consciousness

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Altered States of Consciousness (ASCs) or trance states are often a topic in esoteric, but seldom in scientific psychological literature. The goal of this article then is to develop a theoretical model that can explain the processes in Altered States of Consciousness. Examples discussed are on hypnosis, meditation, and possession. This theoretical model includes perceptive, motivational, cognitive, and psycho-physiological aspects. The discussion of the model consists of (1) the induction of ASCs, (2) dealing with the states themselves and (3) an explanation when and why ASCs end. At the end of the article, a definition of trance is presented, as derived from the theoretical analysis.

This article is an attempt to describe the processes occurring in Altered States of Consciousness (abbreviated as ASCs in the following parts of the article). Its main objectives are to analyze these processes and to develop a theory.

A theory, from a systems theoretical point of view, is a complex series of statements concerning many variables, their causal relations, and the changes in these variables and relations (Bischof, 1997). Being causal, the relations between these variables can be therefore formulated in "If - then - statements", e.g. if the activation rises, the resolution level of perception decreases. Given such

relations, the theory can be simulated on a computer upon further development. Hopefully this proposed theory encourages discussion and critique.

Altered States of Consciousness (ASCs) have always been a fascinating topic not only for psychologists but also for everyone. This interest stems from three reasons. First, many of us experience ASCs when we daydream, sleep, drink alcohol, pray, meditate, undergo hypnosis, or participate in a mass demonstration. Second, when we experience these, there is much intensity, power, and value attributed to these that influence decisions, attitudes and perceptions in life. Third, and probably the most important reason, is the mysticism surrounding the subject of ASCs. In many cultures the experiences of ASCs are related to gods, to spirits, or to ghosts, often suggesting the existence of invisible powers that influence our behavior. These experiences may be fascinating, threatening or both to the person in an ASC.

Due to this mysticism, it is no wonder that a lot of literature exists about ASCs: experiential reports, new esoteric literature, and psychological descriptions. But in spite of all this literature, we still have a difficult time finding serious psychological literature that theoretically explains the processes occurring in ASCs. Of course, there are a number of theories, such as Freud and his followers' psychoanalytic theory which describes trance as dissociation or regression (see overview in Becker, 1995, pp. 221-306). There are some cognitive and information processing approaches which explain trance states as changes in cognitive functioning (Miller, Galanter, & Pribrim, 1960; Hilgard, 1977; Wier, 1998). There are neurophysiological theories about ASCs (Winkelmann, 1986; Goodman, 1992, pp 9-24; Kossak, 1993, pp. 216-232) which hardly explain the subjective experiences in ASCs. There are social, anthropological and cultural psychological theories which explain

ASCs mainly through specific cultural traditions, behaviors, and belief systems (Wittkower, 1970; Ward, 1989; Quekelberghe, 1991; Bourguignon, 1994). There are more applied theories about ASCs especially in Clinical Psychology describing the use and efficiency of ASCs as a therapeutic intervention method (Erickson 1983; Meyer, 1992).

These theories, however, still prove to be unsatisfactory as they mostly describe isolated aspects of ASCs. One reason for this lack of theories about ASCs nowadays might be due to the fact that psychological researchers prefer to study phenomena on the micro-level, e.g. the changes in brain waves during the perception of a green slide presented for 10 milliseconds. Doing research on the micro-level, psychologists can use their positivist, well-known statistical methods. These bring about certainty, but they do not help in the development of theories. For a while it becomes easy to control the variables, to come up with results, and to publish them in journals. Such methods, however, do not enable one to risk answering questions that no one asks (refer to green slide example) and these methods avoid answering questions that many people ask (e.g. about ASCs).

If we want to develop a theory, we have to combine the micro- (the details) and macro-levels (the whole). Therefore, it makes sense to look at these processes and their interaction and not to isolate only one aspect. It is my basic assumption that an ASC, like every complex psychological phenomenon, is a collective process where motivation, emotion, and cognition interact in a certain social-environmental situation (see Psi-Theory of Dörner, 1999).

Describing phenomena

Development of a theory involves observation and description of phenomena in detail. Phenomena can be described: (1)

subjectively, (2) physiologically, and (3) psychologically. Subjectively, we can talk about ASCs and discuss experiences we have had in ASCs. We can talk about what the experience means for us, and how we felt and thought about it. Physiologically, we can, for example, measure brain waves and heart rate. Here, the physiological movements and changes can be detected, measured, and recorded objectively. Psychologically, we can try to develop a theory about these processes involving motivational, emotional and cognitive aspects. Using our knowledge of previous research and a holistic sense of the experience, we can attempt to provide an explanation for this experience. Before we develop the theoretical model, a description of the three different ASCs: hypnosis, meditation, and possession, is presented.

Hypnosis

> *"Now I would like for you to make yourself comfortable in your chair. You may experience the need from time to time during the session to adjust yourself and make yourself more comfortable. That will be fine. Now I would like for you to choose a spot up there where the ceiling meets the wall. Just find one spot that you can keep your eyes on. I am going to ask you to keep your eyes focused on that spot..." (Meyer, 1992, p. 39)*

A hypnotic session may start in this way. Upon reaching the state when eyes are closed and deep relaxation is achieved, the hypnotist then proceeds to deepen the experience. Later, he asks the client to, for example, imagine certain situations like walking at a beach. Many times the client is asked to be aware of his or her breathing, or is asked to feel a weight on one arm and none on the other arm (what is known as "arm levitation technique"). These are only a few examples of hypnotic exercises (for a brief overview of hypnosis see Wagstaff, 1994; for hypnosis application see Cheek, 1994; for a complete discussion of hypnosis see the textbook of Kossak, 1993).

Meditation

Meditation is a ritualistic procedure intended to change one's state of consciousness by voluntary shifts in attention (Farthing, 1992, p. 421). Meditation plays an important role in all religions (Bourguignon, 1994, p. 305). In Christianity, meditative praying is exemplified by the rosary. Ignatius of Loyola, for example, was a master in meditation and praying exercises. In Buddhist meditation, the person tries to clear his mind through, for example, observing his or her breathing in a special sitting position (De Silva, 1993). In Zen Buddhism, the Zen-master sometimes gives a riddle to his disciples, which can not be solved by rational thinking. An example of this is "What is the sound of one hand clapping?" While meditating and using the "gut" instead of the "head", the disciple can also come to a deeper awareness. Some kind of meditation consists of a repetition of words or syllables like "Ohm". Others consist of the repetition of motor behaviors, like in Tai Chi or Kung Fu. The most important goals in meditation are to become one with the universe (world spirit atman in Hinduism, *unio mystica* with God in Catholicism) and to acquire a deeper knowledge of the basic rules of life.

Possession in Brazil and the Philippines

Possession is an ASC which can have different forms and is found in most countries, e.g. Haiti (Ravenscroft, 1965; Métraux, 1994), Liberia and Brazil (Wittkower, 1970), Puerto Rico (Koss, 1975), India (Shekar, 1989), the Pacific basin (Mageo & Howard, 1996), and especially African countries (Peltzer, 1996). Broadly speaking, possession means that the possessed person has the feeling that another entity has taken over the control of one's body and mind. As possession states are probably not so familiar to many readers, they will be descibed in more detail than hypnosis and meditation.

Possession states in Brazil and the Philippines are described as examples for the western and the eastern world.

Brazil

Umbanda and Candomblé are Afro-Brazilian religions consisting of combined Christian, spiritualistic and African beliefs and practices (Becker, 1995). Spirit possession plays an important role during the ceremonies in Umbanda and Candomblé (Berkenbrock, 1995). In a session which is headed mostly by a Mãe de Santo (holy mother), special drumming rhythms are played by experienced drummers. These rhythms call the spirits of certain gods or ancestors, which then enter the bodies of certain persons called mediums (Fohr, 1997). When the spirit enters his or her body, the medium shows an immediate and dramatic change in behavior, sometimes accompanied by shouts and certain dance movements (Güss, 1997). Behind the medium stand one or two persons to guide behavior, and to prevent the medium in trance from leaving the room, from falling or hurting oneself. Wittkower (1970, p. 156f) gives a vivid description of the beginning of possession states he observed in Haiti, Liberia, and Brazil.

> *"The first stage, the stage of self-absorption or trance is often preceded subjectively by an aura with dizziness, pressure on the head, blurring of vision and auditory buzzing, and objectively, by trembling, bodily imbalance and increased activity. Sometimes, the trance commences with a shout, sob or hiss. During the stage of trance, the individual can still be diverted by external stimuli while during the second stage, the stage of possession, he has lost contact with the world around him..."*

Sometimes people ask the mediums for help and regard the few words that the mediums utter in a possession state as holy messages.

Possession plays an important role during the religious rituals in Afro-Brazilian religions (Figge, 1972).

Philippines

In the Philippines, possession states are common occurrences especially in the provinces. Here, one example illustrates the phenomenon.

> *"The oldest sister in a family died. While her body lay in a coffin, her spirit possessed the younger sister who thus entered a trance. The sprit of the older sister, speaking through the younger sister said, 'Mommy, please fix my hair.' The mother opened the coffin and combed the girl's hair. The spirit, speaking again, through the possessed younger sister, said, 'Thank you, Mommy.' "(Bulatao, 1992b, p. 106).*

Possession, the belief that a spirit enters the body and takes control over its actions, is called *langkap* or *sapi* in Tagalog. In the Philippines, we find a strong belief in God and in Catholicism. Hand in hand with this exist many animist and superstitious beliefs. Children, for instance, are brought to the coffin before the burial so that the spirit will not visit them. In addition to this, children should not take a midnight snack or else their spirit will be locked in the jar that they took food from. Children should not play at night outside because they might unintentionally hurt the spirits or dwarves they do not see, and this will cause them pain, disease, or misfortune. Children and adults should not sleep with wet hair because they might go blind or crazy[1]. Other examples of superstition are *mangkukulam* (psychic people that can cause maladies), *aswang* (creature of the netherworld), *gayuma* (love charms), and *anting-anting* (amulets or talismans) (Roces & Roces, 1997, p. 216). A common life example highlights these superstitious beliefs: While talking to a student of a university, for instance, about swimming in the university pool, he said:

"When I go there, I look, if someone is swimming. If I am alone, I do not swim, because I am afraid that a certain power pushes my foot down and I will drown. And then, there will be no one to help me."

This is the belief, despite the fact, that half of the swimming pool is only about 5 feet deep and allows a person of average height to stand.

Hypnosis, meditation, and possession were described as examples of ASCs which the reader might find him- or herself familiar with. This is not astonishing considering that phenomena such as trance and/or possession are found in more than 90 % of 488 societies of the world (Bourguignon & Evascu, 1977). This means that ASCs are quite common human phenomena. In most cultures, ASCs are fundamental human experiences which are labeled and explained according to different cultural world-views.

The three mentioned examples show different aspects of ASCs as well as their similarities. Common subjective experiences of hypnotized, meditating, and possessed persons are described as (see e.g. Lewis, 1989): individual motivation to reach an ASC, unawareness of the surroundings, rejection of external stimuli and focus on inner stimuli, changes in the feeling of "ego" and feeling of "oneness" with the world, lack of voluntary movement, automatisms in act and thought, changes in the feeling of time, associations and imaginations, amnesia, and feeling of security. These experiences provide a common denominator to the numerous types of ASCs.

These commonalities, however, lend themselves to further analysis. As such, the following questions are posed: How can the process in ASCs be described? What is the neurological basis of ASCs? Which forces produce ASCs? Why do ASCs occur? What is the function of ASCs? Before answering these questions, definitions of ASCs are presented.

Definitions

Being conscious of doing something means intending to do it, knowing what to do, feeling oneself doing it, and controlling oneself while doing it. This is opposed to being in an ASC which means not following certain goals, having less control over one's behavior, and feeling one's ego less. Bulatao (1992c, p. 85) describes ASCs as follows: "Some forms of it or other names are Zen, Yoga, Transcendental Meditation, the relaxation response, hypnosis, trance, a "high", etc. It is such a fundamental experience that it can not be defined..."

Giving complete and precise definitions in the area of ASCs is difficult. First and foremost, there exists a huge variety of forms and definitions and each one highlights a certain aspect of ASCs (Büttner, 2000). For example, the term "ecstasy" is often used to refer to the subjective experience of high emotional and motor activation; however, high emotional and motor activation are non-exclusive terms to ecstasy and are also found in possession. Therefore, it is hard to separate these two states as ecstasy can be a part of possession. Due to its non-exclusive nature, strict definitions and separations of ASCs seem to be impossible.

The second problem of defining ASCs is that there is no sharp distinction between conscious behavior and ASCs rather, they lie on a continuum (Bulatao, 1992a). Our thoughts might sometimes be highly conscious, e.g. in problem solving activities, and yet sometimes, we let our thoughts flow, e.g. in daydreaming, where they are partly unconscious and wherein we often do not remember how we came to the last sequence of thoughts. In many activities in our daily life, we do things without being aware of them. For example, if we drive a car, we are not focused on every single movement of our feet and arms because we have done these behaviors thousands of times. Thus, these behaviors have become automatic and unconscious (Rasmussen, 1983; 1986).

A final problem in giving a definition is that we wrongly assume that we can know and totally capture the phenomenon in a sentence. In essence, our eyes and minds are focused on certain isolated aspects that we are not open enough to observe the whole phenomenon. Therefore, a definition that acknowledges these difficulties and limitations is presented at the end of this article, as a result of this analysis and discourse.

In the meantime, as a working definition, the definition of the Diagnostic and Statistical Manual will be used. The DSM IV (1994) distinguishes between dissociative disorders, and normal and voluntarily occurring trance states in specific cultural settings. When these trance states are attributed to another entity, the DSM IV speaks of possession. Some trance states are classified under the large group of dissociative disorders. According to the DSM IV (p. 728), a dissociative trance disorder is a trance marked by "loss of customary sense of personal identity" associated with a "narrowing of awareness... or stereotyped behaviors". But the DSM IV (American Psychiatric Association, 1994, p. 727-729) also mentions that many trance states occur voluntarily in a specific cultural setting without distress and are regarded as quite normal. Possession also refers to trance states, but here, the medium and others interpret the trance states involving the presence of another entity. These trance states are interpreted as products of external agents. These external agents are labeled as spirits, demons, devils, ghosts or gods (Bourguignon, 1976; Amorim, 1990; Oughoulian, 1991; Mageo & Howard, 1996). The labeling is dependent on specific cultural conceptions and belief systems. Therefore, trance and possession refer to the same phenomena: however, the interpretation of these phenomena is different. Both trance and possession are regarded as diseases if they are not accepted as a normal part of cultural practices and if they cause distress.

From this point on in the article, the term trance or ASCs will be used interchangeably as a general category which includes different states of consciousness like possession, hypnosis and meditation.

Psychology as a science tries to explain these ASCs without assuming external forces like ghosts, gods or spirits, but instead, analyzes the processes within the person. Unfortunately, the western cultural background of many researchers and their lack of experience with ASCs lead many of them to immediately assume that ASCs are diseases. In some cases, ASCs are diseases (DSM IV, 2000). ASCs might be symptoms of diseases caused by enormous stress, especially when they occur outside a specific setting and when they occur spontaneously. In many cases, however, they are a natural part of cultural practices. Therefore, it makes sense to observe and analyze first before judging and diagnosing the unknown and the mystical.

Hence, to observe and analyze the phenomenon, theoretical analysis will contain the following topics as the essential parts of the model: a) Motivation, b) World in the head c) Perception and trance induction, d) Modulations of the system, e) Protocol memory and self-reflection, f) End of trance, and e) Trance interpretation.

Motivation

What triggers ACSs? Like most human behaviors, ACSs are motivated (Krippner, 1989; Ward & Kemp, 1991, p. 178). People are motivated to undergo ASCs for the following reasons (Krippner, 1989): People go into trance to seek advice, healing or consultation from a faithhealer or a hypnotist. They also undergo ASCs because they are curious about and fascinated with the unknown; and some have kept the habit of going to trance sessions. Some attend ritual sessions and go into ASCs because they like meeting others, e.g., in candomblé or umbanda; they like being admired by others; and

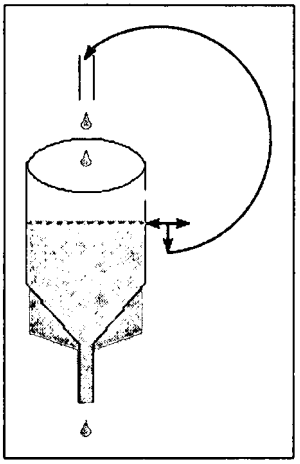
they feel good as a result of being in trance. There may be many other motivations, but most of them can be summarized under the following categories (Maslow, 1970; Dörner, 1999):

- self-preservation (e.g. health, pain avoidance, energy),
- affiliation (e.g. meet others, be admired by them, sexuality),
- reduction of uncertainty (e.g. solve problems, explain the future) and
- enlargement of competence, i.e. to be able to satisfy needs through own knowledge and abilities, which result in enjoyment or pleasure.

The beliefs in ASCs and the relation of these beliefs to social characteristics can also highlight which motives underlie ASCs. Bourguignon (cited in Resch, 1990, p. 154) found that ASCs mostly occur in societies characterized by a depressing social structure, the loss in confidence in the efficiency of social institutions, and the apparent inability to cope with the evils of these social structures. People living under such circumstances might have a strong need for uncertainty reduction and for an increase in competence. Inducing ASCs is one method to experience certainty and to increase competence in a reliable and secure setting. Therefore, ASCs can be coping mechanisms as well. Of course, this coping refers more to internal thoughts, emotions, and conflicts rather than to changes in the external environment.

Functioning of motives. In essence, the question then is, how do these motives function? The metaphor of an "uncertainty reduction kettle" (see figure 1, Dörner, 1999, p. 357) is used to describe the functioning of these motives. Imagine a kettle. When uncertainty arises (e.g. when we do not know much about ASCs), liquid drops out of this kettle. The motive of knowing more about ASCs (uncertainty reduction) arises. It sets the behavior going,

FIGURE 1



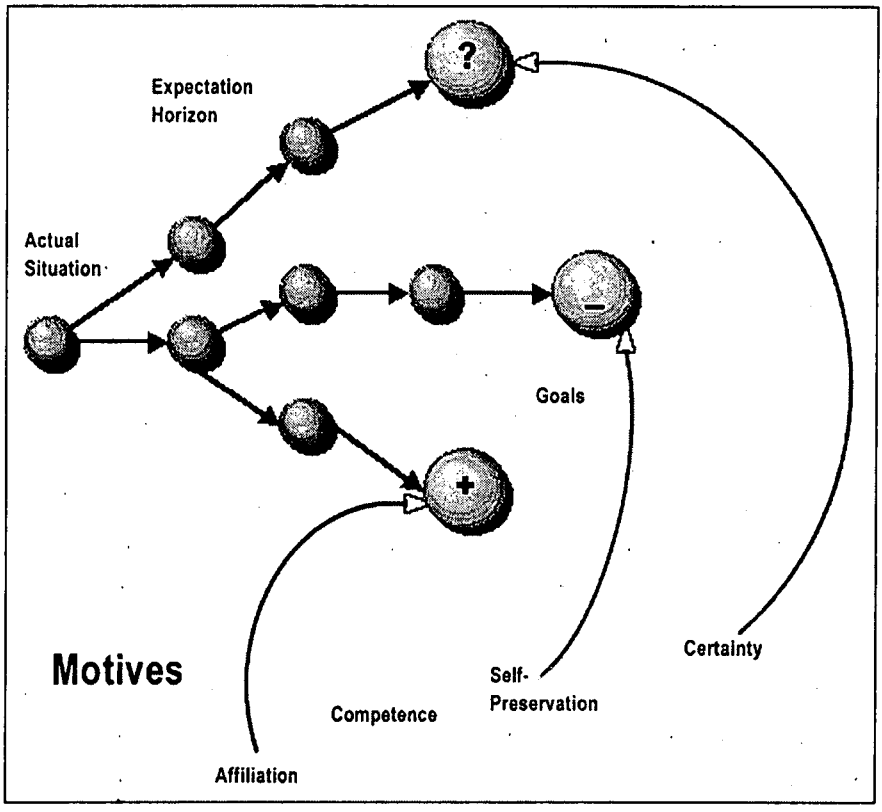
directs it towards a goal and maintains it until certainty is reached. The goals might be to read an article about ASCs or to talk to someone about ASCs. Reading an article about hypnosis or talking to an expert reduces uncertainty, and liquid is poured into the kettle. Therefore when the goal is reached, the pleasant normal and certain level of liquid in the kettle is reached.

We can postulate an uncertainty kettle, a competence kettle, an affiliation kettle, and a kettle for self-preservation (Dörner, 1999). The more these needs are unfulfilled, the more a general sense of dissatisfaction is felt. Consequently, the more these needs are fulfilled, the more pleasure is experienced.

During our socialization process, we learned which situations can help us satisfy our needs and from which situations needs can rise. These situations are stored in our memory, symbolized by the circles as group of neurons (see figure 2). The first situations are pleasant (+) and we try to reach them. For example, meeting friends at a ritual session or talking to a hypnotist will fill up our affiliation kettle. Therefore, we try to be together with them. Situations where needs arise (-), we try to avoid. For example, a child who burned his or her fingers while touching the fire in a ritual setting would then develop an extreme need for self-preservation, i.e. pain avoidance. In the future, the child will be cautious not to come too close to the fire. In the expectation horizon of this child, fire might be a situation that needs to be avoided in the future (-).

More often than not, considering physiological characteristics and subjective comments indicate that ASCs are mostly experienced positively by the person (Maupin, 1990; Ward & Kemp, 1991;

FIGURE 2



Goodman, 1992). This means that passing through a trance state is related to an increase in competence. Moreover, it is related to feelings of relaxation and well-being. As such, no current needs have to be satisfied.

The last examples show how perceptions of the environment (e.g. friends or fire) are related to motivations (e.g. affiliation or self-preservation) and to motor behavior (e.g. go to meet friends or take our hand out of the fire). The specific ASC and the situational characteristics allow many motives such as self-preservation, certainty, affiliation, and increase in competence to be satisfied at the same

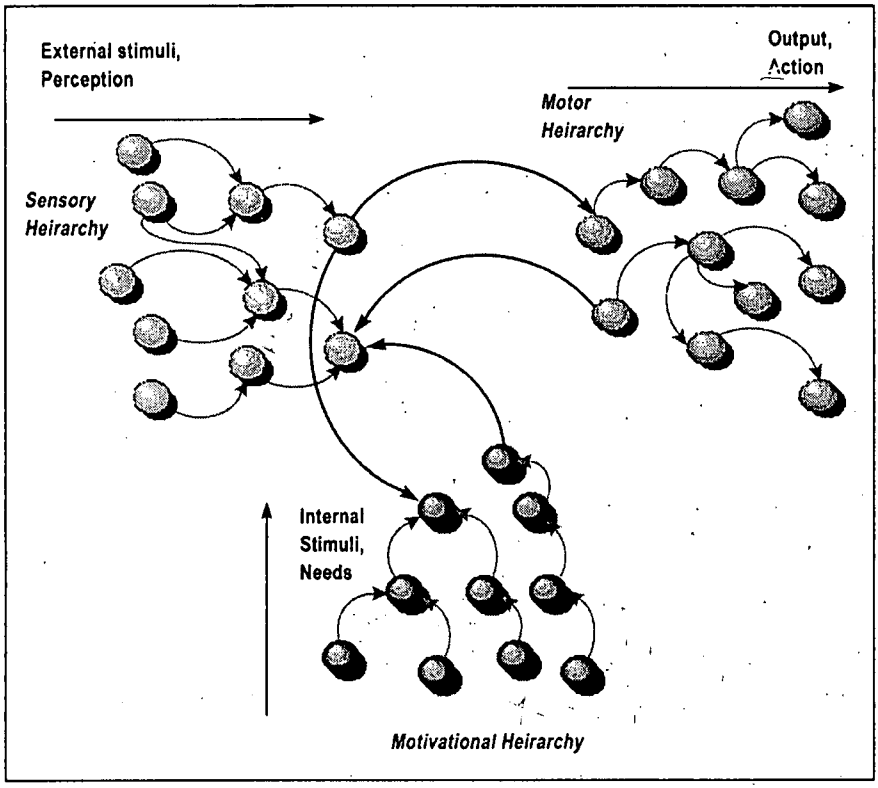
time. Self-preservation in trance occurs through feeling less pain (Pekala & Ersek, 1993; Cheek, 1994, p. 10), saving energy, and recovering. There is no need for uncertainty reduction, as the participants in ritual settings know what will happen next. More importantly, the person in an ASC is highly respected by the community because his or her behavior conforms to the group's norms and expectations, satisfying the affiliation motive. Trance also increases one's competence because the person is able (or has the mystical gift) to reach the ASC. Satisfying all these needs results in feelings of joy and pleasure. This explains why ASCs play such an important role in healing and individual well-being in many societies.

Representation of the world in the head

The sum of our experiences and beliefs about the future makes our world-view. This world view is saved in memory; more precisely, as sensory schemas about objects, motor schemas about actions, and combinations of sensory and motor schemas (Schaub, 1997; see figure 3). In figure 3, the schemas are symbolized by circles which themselves symbolize groups of neurons in the human brain. Some of these sensory-motor schema combinations are learned and repeated so often that they become automatisms, i.e. their execution goes automatically without the need of higher cognitive control, e.g. driving a car for someone who has driven for a long time. Other examples of automatisms are praying the rosary, and performing dance steps in a ritual trance dance. These automatic behaviors are triggered by certain characteristics of the situation.

This world-view also includes knowledge, i.e. sensory and motor schemas of our self. For example, we know that we are female or male, that we have a certain age, a certain role in family and society. All these schemas, which include information about ourselves, form the image of our self.

FIGURE 3



Sensory-motor schemas are put together to form behavior programs which help us achieve goals. The following is an example of a behavior program. If I am thirsty (motivation), I go to the kitchen (motor program), observe the way to the kitchen that I do not hit myself anywhere (sensory schema), get a glass (motor program), fill it with water (motor program), look that it does not overflow (sensory schema), put it to my lips and drink (motor program) until I am not thirsty any more (motivation). This process, indicated with the arrows in figure 3, is a combination of many different sensory and motor schemas put together in a sequence of behavior. This example also highlights that this behavior program was motivated, i.e. "I was

thirsty". The first sensory schema which will help me satisfy my thirst is that I was thinking of a glass of water.

In many societies, sensory and motor aspects of the world-view are related to ASCs. A child that goes with his parents to a certain faith healer or shaman will observe what the shaman is doing (sensory schema). Perhaps the child will not completely understand what is going on, but surely he will understand the significance and importance of this visit for all the family members (motivational aspects). If the child asks his parents afterwards what happened, the parents would give an elaborate explanation of the ritualistic situation. The child will then learn how to interpret the session and the actions of the shaman (motor schema). Furthermore, the child will learn that the faith healer or the shaman has a powerful position in society (attribution on the faith healer or shaman as a sensory schema).

Perception

Perception, under a constructivist point of view, is not the mere reproduction of the world outside. Rather, it is the interpretation of the sensory input on the basis of our world-view, our prior knowledge, beliefs and expectations (Neisser, 1976). This perception can refer to stimuli from the outside - like the healer, shaman, and hypnotist (exteroception) - or to stimuli from inside - like thoughts, pain, and body temperature (interoception).

However, before the sensory input is interpreted, it is important that the sensory schemas are formed. Schemas are formed through assimilation and accommodation (Piaget, 1973). This means that incoming information is compared with existing schemas. There is a fit when the information is recognized from previously existing schemas (assimilation). If there is no fit, the schema has to be changed in order to perceive the new information (accommodation). Schemas may be concrete (e.g. schema of a cat) or they may be abstract (e.g.

schema of liberty). They may also be specified through new perceptions, e.g. including a Siamese in the cat schemas, and with special attributes, e.g. the attributes wild, lovable for a cat.

Trance Induction

ASCs can be induced by oneself, by another person or they can occur spontaneously (Bulatao, 1992c, p. 84; Cheek, 1994, pp. 27-37). Induction by oneself includes the use of drugs, the concentration on a mantra, and meditating in prayer. Induction by another person may occur with the aid of a hypnotist, an Indian guru, a Filipino faith healer (*manggagamot*), a spiritual leader, a priest, a hypnotist, a Buddhist Zen-master, a Hungan in voodoo possession or a *mãe de santo* in Brazilian candomblé or a shaman. Spontaneously occurring ASCs are caused, for example, by lack of energy (blood sugar) or extreme pain when seriously injured (Cheek, 1994). They may also be an unconscious call for help, i.e. a way to communicate something that can not be communicated directly without violating cultural norms and values. As such, the underlying intention needs to be expressed in an indirect manner. For instance, a child who is possessed can criticize her parents, get angry at them, and shout at them. Consequently, her parents cannot punish her because they cannot make her responsible for these actions. Thus, by being possessed, the child was able to communicate something important that, in a conscious state, cannot be easily said.

All these ASCs, whether they are induced by oneself, by another person or occurring spontaneously, lead to a combination of the following changes (Tart, 1975): changes in external stimulation, physical activity, physiological state, and focus of attention. It should be noted that changes in the physiological state induced by drugs, a decrease of oxygen or energy in the body, hyperventilation, etc. will not be primary considerations in the following explanations as these

play a minor role in the induction of hypnosis, meditation, and possession. Figge (1973, p. 195), for instance, points out that in ritual possession states in Brazil, alcohol is consumed, but in none of the observed possession cases was the amount of alcohol enough to explain ASCs. Moreover, psychoactive drugs lead to complicated physiological changes that cannot be described here in detail.

Changes in external stimulation

Changes in external stimulation come in the form of suggestions by the hypnotist, repetitive mantra done by oneself while meditating, drumming and dancing in voodoo possession or Brazilian umbanda and candomblé (Rouget, 1985), or singing and meditating in Pentecostal groups (Coons, 1993). All these described stimuli may lead to trance states.

These changes in external stimulation refer to the amount or variety of sensory input. The amount refers to the intensity (e.g. brightness, loudness) and frequency of the incoming sensory stimuli. Variety pertains to a number of different figures perceived at one time. The variety of these figures can be high or low, e.g. the music in an opera or the monotonous rhythms of a drum. We can group several ASCs along these two dimensions, i.e., amount and variety, (Südtfeldt, in Dittrich, 1987, p. 19). For example, if a person meditates in a silent room with eyes closed, the amount of sensory input and the intensity of the sensory input decrease. The numbers in figure 4 are explained below:

1. Sensory deprivation (e.g. Moses or Jesus in the desert)
2. Perceptive deprivation (e.g. lying in a bed in a dark room and listening to a mixture of unrecognizable auditory stimuli)
3. Hypnagogic state (e.g. the state between wakefulness and sleep with no clear goals)

4. Heterohypnosis (e.g. concentration on the voice of another person so that the perception of the rest of the environment is reduced)
5. Autohypnosis like meditation or autogenic training (e.g. concentration on one stimulus so that the perception of the rest of the environment is reduced)
6. Stimuli overload through intense but monotonous stimuli (e.g. drum rhythms or running in a marathon race)
7. Stimuli overload through high variability of stimuli (e.g. wherever one turns into a crowded market-place, there are always new stimuli)

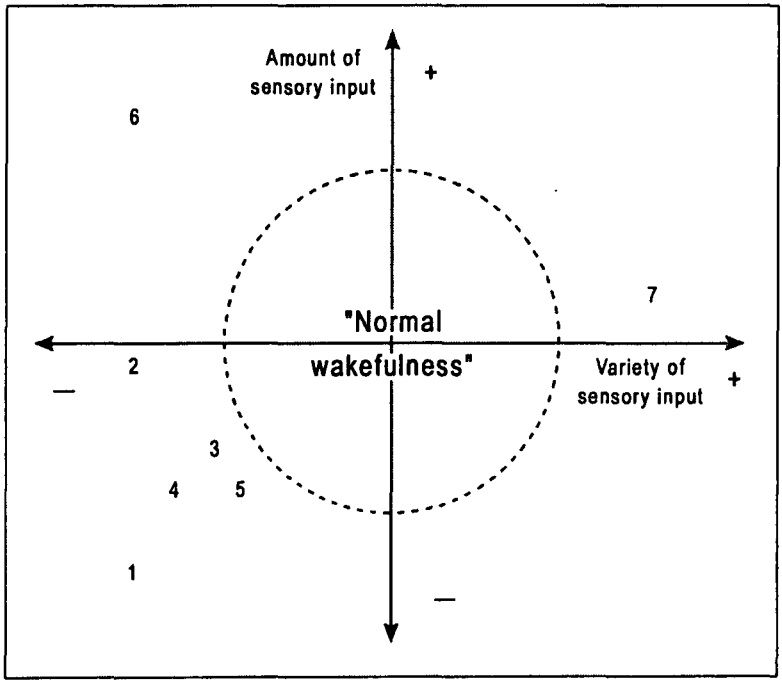
Questions then arise: What are the psychological effects due to low or high amount and variety of sensory input? A change means that the present state of a system is not maintained, but that certain parts of the system are modified leading to another state. What exactly changes?

Before discussing the answers to these questions, psycho-physiological changes in trance states will be elaborated on as they refer to these stimuli variations.

Changes in the psycho-physiological state

The basic psycho-physiological measures pertain to brain waves, hormones and blood circulation. In general, trance is a state with parasympathetic dominance, i.e. heart rate, and respiration rate decrease (Cheek, 1994). Stages 1 to 5 (refer to figure 4) are constantly characterized by parasympathetic dominance. In stages 6 and 7, the brain is overwhelmed with stimuli, thus leading to a sympathetic dominance. It may be that during excessive dancing or motor behavior, the sympathetic system will be activated. It may not be clearly seen that this will later induce a state of parasympathetic dominance as a protection from overstimulation. This activation

FIGURE 4



leads to exhaustion and a collapse of the sympathetic system; consequently, the parasympathetic system becomes dominant (Winkelmann, 1986).

Physiologically, a trance state is a paradoxical state (Klemm, 1997; Guttman, 1992). The state is paradoxical because some physiological characteristics are indicators for extreme relaxation like parasympathetic dominance, while others are indicators for extreme activation like highly increased pulse rate.[2] Below are examples for this paradoxical state. The arousal in the frontal cortex is high and the pulse rises while the basic activation, the tonic state in the reticular formation, is low, and blood pressure, adrenaline, noradrenaline and cortisol levels drop (Schandry, 1989; Goodman, 1992). As the reticular formation gives neuronal energy to the cortex for it to function, low

activation in the reticular formation leads to low activation of the cortex. These paradoxical characteristics are detailed when measuring brain waves with the electroencephalogram (EEG). Measuring brain waves was used in studies with Buddhist Zazen monks (Kasamatsu & Hirai, 1990) and Indian yogis while they were meditating (Anand, Chhina, & Singh 1990). During the state of parasympathetic dominance in meditation, low alpha brain waves were dominant and indicated a relaxed state.[3] These brain waves showed a decrease in alpha and theta waves in the cortex, but an increase of alpha and theta waves in the frontal cortex (Davidson, 1976). A similar pattern of increasing alpha waves is found during hypnosis indicating a state of relaxation (Edmonston, 1991). But why then is the frontal cortex not activated?

The frontal cortex is mostly associated with short-term memory. The activation of the frontal cortex with alpha and theta waves suggest that information is registered in short-term memory and that schemas are activated. These schemas could be the suggestions of the hypnotist or the repeated prayers in the rosary. The general decrease in alpha and theta waves in the other parts of the cortex comes from decreased activation of the reticular system and indicates that the long term memory is not activated.

It is important to note that EEG waves in trance are more similar to waves of a wakeful state than to those of sleep. The only common feature between the brain waves measured in the cortex and the frontal cortex is that the focus of attention is directed inwards. This means that less external stimuli reach the brain and that the brain regulates itself from internal stimuli (Klemm, 1997). This interpretation of the brain waves as a rejection of external stimuli is similar to characteristics of the cardio-vascular system during trance. In trance, the heart rate and blood pressure drop. Attentiveness to external environment is mostly related to an increase in heart rate

and blood pressure, but rejection of the external environment is accompanied by a decrease in both.

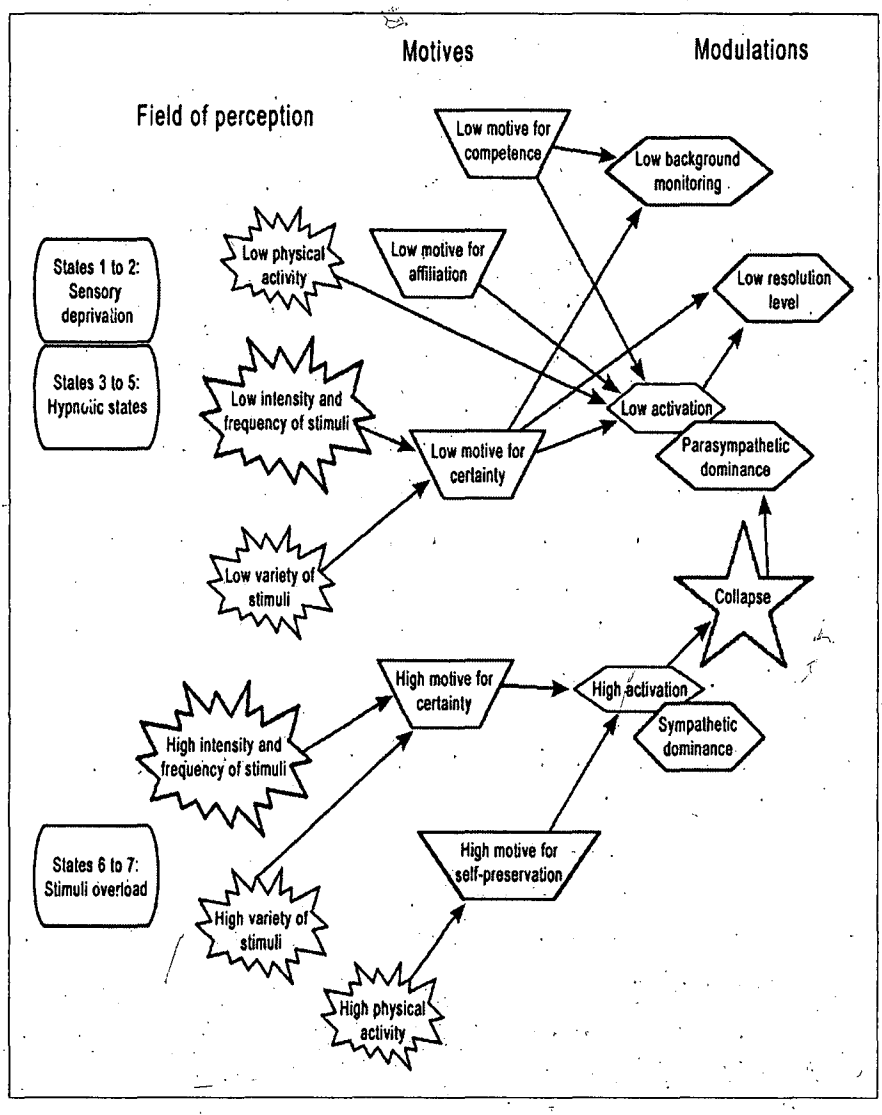
These results from psycho-physiology are important for further discussion of trance. In trance, there is low general activation and low arousal. Since it is only the frontal cortex that is activated, this indicates that stimuli are worked on and schemas are activated in the working memory, but the long-term memory is relatively inactive. Subjective data, e.g. interviews and questionnaires (Maupin, 1990; Ward & Kemp, 1991), and objective data, e.g. brain waves, high amount of beta-endorphins, and low amount of stress hormones (Goodman, 1992), show that the trance state is positively experienced. The switch from sympathetic to parasympathetic dominance is related to conditioned responses to stimuli, the loss of memory, and high suggestibility (Winkelmann, 1986). The trance state progresses with a rejection of external stimuli and a focus on internal stimuli.

Consequences of induction on motives and modulation parameters of the system

What happens during the induction of trance? The following paragraph will describe that certain modulations of the system are responsible for certain characteristics of trance and experiences in trance. Modulations are changes in the characteristic way of how psychological processes take place (Dörner, 1999). These modulations are caused by the specific motivations in ASCs, the specific characteristics of the field of perception, and the related psycho-physiological changes (see figure 5).

States 1-5 are characterized by high certainty due to a low amount (i.e. intensity and frequency) and variety of external stimuli. The motive of uncertainty reduction is not active. But states 6 and 7 are characterized by high uncertainty due to the high amount and variety

FIGURE 5



of external stimuli. These stimuli characteristics lead to an activation of the uncertainty reduction motive. As it is impossible to observe all the characteristics of the situation, uncertainty is then reduced by

a very low *resolution level* of perceiving. The resolution level is the extent of perceiving the situation and analyzing it. In the described states where it is low, the external environment is not observed in detail. It is like putting blinders in front of one's eyes. In states 1-5, the resolution level is low because sensory stimuli are too simple to be observed in detail, in states 6 and 7, it becomes low as the stimuli are repetitive or too complex. The consequence in all states (1-7) is that the environment is not explored in detail.

A similar pattern to the resolution level is found in the general *activation*. Activation is physiologically shown in high breathing rate and quick heartbeat. It goes hand in hand with sympathetic dominance where high activation results in certain motivational adjustments and leads to an activation of motive relevant schemas (such as a sandwich schema when someone is hungry) and behavior programs for its achievement (such as going to a fast food restaurant). As there is no need for uncertainty reduction and competence, the general activation is low in states 1 to 5. It is also assumed that the motives of self-preservation and affiliation are not active. In states 6 and 7, the motive for self-preservation and the motive for certainty led to a high activation. This becomes low after the collapse of the sympathetic system. This is when only the frontal cortex is activated.

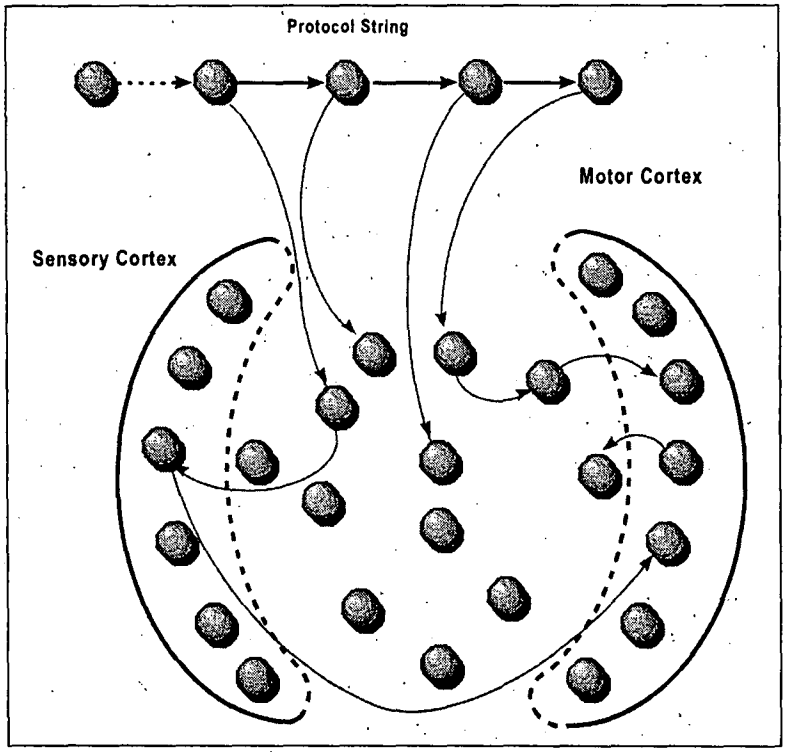
As a consequence of high certainty, relatively high competence, low resolution level and other inactive motives at the beginning of ASCs, the *background is not monitored*. This means that the background of the situation does not need to be observed and controlled. The trance person is in a stable environment where he or she knows and trusts the people in the ritual and the ritual procedure. Background monitoring is also not necessary because expectations of the future are very certain. Altogether, these conditions give the person in trance the feeling of security to concentrate on specific inner stimuli.

Protocol memory and self-reflection

Starting from memory theories describing the brain as a neuronal network, we no longer distinguish between separate units like short-term memory or long-term memory (Dörner & Schaub, 1998). It is assumed that only one memory exists where there are no distinctions, but where certain information is active at a certain point of time. This memory continuously creates a memory string which is the protocol (see figure 6).

The protocol consists of an active protocol-neuron which is related to the previous active protocol neuron which itself is related to its previous protocol neuron and so on. All these protocol neurons form

FIGURE 6



a string which contains information about the situation, behavior, and events. It consists of sensory schemas from perception, motor schemas of single actions, sensory-motor schemas of automatisms or longer motor programs, sensory-motor schemas of words, and information about the motivational state (see "Representation of the world in the head"). All these schemas again refer to other more basic schemas. The sensory schema of a shaman, for instance, is related to schemas of his clothes, to schemas of his mantra, and to schemas of his dances.

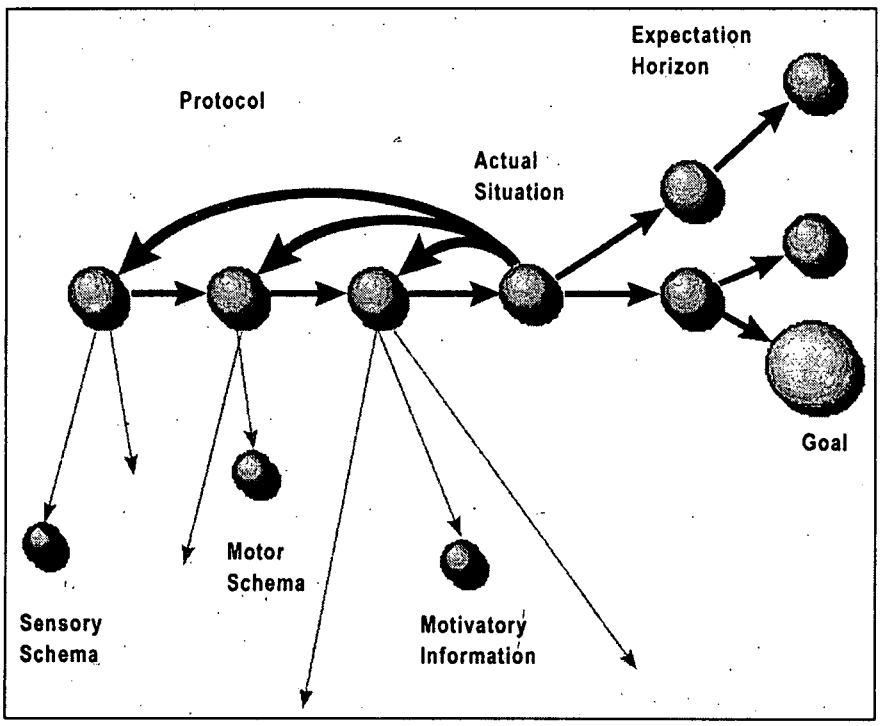
These connections between neurons in the brain can be strong or weak. Experiences with strong emotions result in strong connections between schemas that are maintained for a long time, sometimes even for an entire lifetime. Many of these connections between neurons however, subside with time which explains why we forget. Forgetting for most people may be frustrating, but it has its advantage. In essence, those connections that are not needed wane and create a place for new connections that are more important. Forgetting details also results in more abstract schemas leading to the fact that perceived things are considered to be the same because they look alike. No separate schemas are needed then for objects that almost look alike, employing a very economical process.

It can be assumed that protocol impulses occur at certain time intervals. It has been shown that presented stimuli within 30-40 milliseconds cannot be successfully organized by the brain (Pöppel, 1985, cited in Tisdale, 1998, p. 205). In stimuli overload situations, the brain "collapses" after a certain time because it can no longer detect the stimuli and work on them. The feeling of consciousness therefore requires short-term stability in the context of experience, i.e. to be able to identify stimuli, compare them with existing schemas, and create new schemas.

Consciousness is related to protocol memory. On the basis of this protocol string, we can develop theories about thinking and self-reflection, both of which are characteristics of the normal wakeful state. But thinking and self-reflection are experienced to be low in ASCs.

When we think, we go back to the protocol string to the particular information we need to work on (see figure 7). Then, we go in a new direction to combine this information with another one. If we do not find the necessary information, we create it by making new combinations of schemas. Thinking is activating the protocol string and building new links between the activated neurons. Thinking requires working memory resources (Kosslyn, 1980). This means

FIGURE 7



that the brain needs free capacity and a certain activation in the working memory to be able to think, to deal with memory contents, and to combine them. If the cognitive system is not activated enough (states 1-5) or is overwhelmed with stimuli (states 6-7), then there are not enough working memory resources for higher thinking processes. Thinking also requires retrieving important facts from long-term-memory and connecting them to the problem currently worked on in the working memory. But as previously discussed (see "Changes in the physiological state") only the frontal cortex (working memory or short-term memory) and not the other parts of the cortex (long-term-memory) is activated. This conscious and controlled remembering is replaced by a more associative uncontrolled remembering in ASCs.

With these suppositions, how can the "Ego" be found in this protocol string? Schemas about self, body, experiences, and roles are one part of the protocol. The self-concept develops by connecting experiences to these schemas of the self. To be conscious means to access previously recorded contents of the protocol (Tisdale, 1999). To be self-aware means to process the protocol, i.e. to work on the information about oneself. For instance, this is shown in the following statement: "What did I want to do now? I forgot. Ah, yes, I wanted to search the book..." Klinger & Cox (1987, 1988) showed that 73% of thought samples contained some degree of inner monologue and 67% contained visual-spatial mental imagery. And while these numbers might depend on the specific thinking topic, they nevertheless show how inner speech and self-reflection is related to higher cognitive processes.

Under certain conditions, this self-reflection is suppressed. First, this can be true when energy needs to be conserved under extreme time pressure or when automatic behavior occurs. Second, this can also be true in ASCs. What happens then with the protocol in ASCs?

Oftentimes, in situations leading to ASCs, the contents of the protocol impulses are repeatitive. This may be the case in situations with a low amount and variety of stimuli (repeating words of the hypnotist) as well as in situations with stimuli overload (same drumming rhythms). In situations with a low amount and variety of stimuli the focus of perception is towards internal stimuli. In situations with stimuli, overload, the resolution level of perception declines and external stimuli are perceived in a superficial way. The attention then switches to internal stimuli (see "Changes in the psycho-physiological state"). The switch to internal stimuli happens because the content of the protocol impulses is always the same. The protocol is the same while listening to repetitive drumming rhythms and dancing the same automatic steps during possession in candomblé. The protocol is the same when praying the rosary over and over while contemplating and meditating. This is similar to when the hypnotist gives the instruction to observe a moving pendulum or to focus on a certain point for a long time. In all of these cases, it is emphasized that the protocol always consists of the same schemas. The low resolution level and the repeated stimuli lead to the fact that the protocol is not worked on. For instance, it is seldom that a person goes back to the protocol, i.e. thinking of the last tact of the rhythm and the automatic repeated dance steps two minutes ago. Why should someone go back to the protocol and think about "Mother Mary...."? Why should someone go back to the protocol and think about the point he observed for the last three minutes? These are all behaviors that do not need higher cognitive control. In ASCs, concentration lies on the actual moment itself, not in the past and not in the future (MODEL). It also makes no sense to have expectations about the near future. It can be expected that the same rhythm goes on, the rosary goes on and the point remains there. The situation is highly certain and therefore secure. The setting is

secure because the person in an ASC knows the other individuals present (the shaman, the priest, and the hypnotist) and can trust all of them. There is no active motive for uncertainty reduction, increased competence, self-preservation or affiliation.

Sometimes, for a short period, images, words, or occurrences come into mind during these ASCs, but they are spontaneously activated and cannot be further worked on as thinking is suppressed. These are merely passing thoughts. These memory contents are not related to the outside world because external stimuli are rejected and therefore, they are often experienced as products of the imagination or as hallucinations. During this state, it is also not possible to formulate abstract ideas and grammatically complete sentences. If language occurs, it mostly consists only of a few words that are concrete and not connected to each other (Cheek, 1994). It may also be automatically produced, like in the rosary.

In summary, trance behavior, i.e. the activated motor and sensory schemas, consists of (1) automatic behaviors (e.g. dancing steps) (2) simple concrete speech in improper grammar or memorized sentences ("learned-by-heart"), and (3) purely associative "thinking".

The subjective sensation might be that all is a flowing movement. As a consequence of protocol elements consisting of same information and a lack of thinking and self-reflection, the sense of time is lost. There is no backward movement in the protocol string that can indicate what happened and when it happened. These changes in the protocol memory result in a state of high suggestibility (Cardeña & Spiegel, 1991; Gheorghiu, 1989). Another consequence is very important. As there is no work on the protocol string, no internal dialogue, no analysis of information, and no self-reflection, the person does not "feel" him- or herself. The individual experiences a lack of sensation and is not conscious of him- or herself. This fact is often

described as dissociation, i.e. spontaneous actions dissociated from the usual sense of self-control (Cardeña & Spiegel, 1991).

End of trance

How does the trance state end? There are several reasons for the ending of an ASC (Büttner, 2000). One is that a very strong stimulus from the outside will cause a shift of one's attention towards it. This happens, for example, to a person meditating and then hearing a loud sound of two cars colliding outside. The meditating person will immediately "awake" and probably check what happened. In this case, the motive of reducing uncertainty leads to the action. Imagine the hypnotist saying to the hypnotee in a louder voice than usual that by counting back from 5 to 1, the hypnotee will slowly open his eyes and come back. It is the voice of the hypnotist which guides the behavior of the hypnotee. The voice of the hypnotist is experienced as one's own voice. When the hypnotist says "wake up" again, the hypnotee identifies with the hypnotist.

Another reason for the end of the trance could be the rise of a new motivation, e.g. hunger or thirst. These new motivations will then regulate new actions. When modulation parameters change, i.e. activation rises, background monitoring increases, resolution level increases, and recapitulation and reinterpretation of the protocol increases, the search for motive-relevant stimuli starts. Special sensory schemas of pizza, bread, water, cola or other food and drinks become activated.

A third reason might be the natural end of automatisms related to certain situational factors. We drive a car automatically, as long as we are sitting behind the steering wheel. When we reach the desired place, we stop and get out of the car. We do not drive any more. The automatic behavior stops when the goal is reached. Imagine a person in possession, dancing to a special rhythm. This person has

learned the dancing steps and practiced them perhaps a hundred of times accompanied by the same rhythm. When the rhythm changes, the automatic dancing steps also finish. These movements are interwoven with the rhythm, classically conditioned, and can not be practiced without it. Another example for the natural ending is the rosary. It consists only of a certain number of "Our Father..." and "Mother Mary..." prayers, and has its natural end.

Trance Interpretation

ASCs are considered beyond the normal. Often, the person experiencing an ASC does not remember the details, due to a low resolution level of perceiving and thinking. And as he or she realizes that it is a different state from normal wakefulness, he or she searches for explanations. One explanation is that other entities like ghosts, spirits, gods, etc. enter the body. These entities have different names, like the names of Gods *Oxum, Xango* in Brazil or the names *multo, espiritu* or *tikbalang* (half horse - half man) in the Philippines. Attributing the actions during ASCs to another entity would explain why someone does something that he or she did not intend to do or remember to have done.

Integration and limitations of the theory

In figure 8, the basic assumptions of the theoretical model are integrated. On the left side of the figure, the different characteristics of the field of perception (see "Change in external stimulation") in states 1 to 5 (e.g. sensory deprivation and hypnotic states) and states 6 and 7 (stimuli overload) are described. These characteristics of the situation influence the motives of the individual (see "Motivation"). High variety and amount of stimuli, for example, will increase the need for uncertainty reduction. The motive for certainty will lead to high activation. In cases of stimuli overload,

activation is so high that it leads to a collapse, resulting in parasympathetic dominance (see "Changes in the physiological state"). Activation is one of the modulation parameters described(see "Consequences of induction on motives and modulation parameters of the system"). The other modulation parameters are background monitoring and resolution level of perception and thinking. The later influences the depth of the recapitulation and reinterpretation of the memory protocol (see "Protocol memory and self-reflection" and "World in the head"). The changes in perception, motives, and modulation parameters are responsible for the outcome effects in ASCs like uncritical thinking, disturbances in sense of time, high suggestibility, imagination, and loss of feeling of self (Ludwig, 1972).

Thus, the theoretical model of ASCs integrates psychological processes in perception, motivation, cognition, and action.

The proposed theory is a preliminary model that is subject to change and further completion. There are some facts in ASCs or Parapsychology that cannot be explained with this model. An example is extrasensory perception. How is it possible that someone in deep hypnosis can see another person whom he or she has not met in an adjacent room? Or how about in the instance of two persons in deep hypnosis how is it possible that one of them knows what the other one sees or experiences? These are some facts reported (Bulatao, 1992a). Even if there are – as far as I know - no statistical experiments proving that the probability of their occurrence is higher than chance, it is worth taking them into consideration.

New definition of trance

As a result and summary of this article, trance can be defined in the following way: Trance is an ASC in which the protocol of events is conducted with a very low resolution level and without self-

reflection, thus resulting in a loss of consciousness and feeling of one's self. This low resolution level is the consequence of a certain kind of trance-induction (by oneself, another person or spontaneously induced), a specific field of perception, specific motives, and the resulting modulations of the system. The interpretation of ASCs is done according to the belief systems of culture.

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NOTES

1 Superstitions are mostly directed to children and one can easily imagine the power of these superstitions in the education process.

2 Some of the same physiological features are also found when people bleed to death. Another interesting fact used in the applied medical field is that under hypnosis there is no feeling of pain. One explanation for this fact is that the thalamus does not allow p ain signals to enter (Elbert & Rockstroh, 1993).

3Interestingly, these alpha waves remain dominant in Hindu yogis when they are meditating with open eyes and external stimuli are presented. The alpha waves even remain, when two yogis hold their hands in ice cold water during meditation for 45 minutes. Perhaps afferents are blocked from the reticular activating system (RAS) and thalamus (Elbert & Rockstroh, 1993), which do not allaw pain signals to enter. Alpha waves do not remain in the brain waves of Buddhist monks, when external stimuli are presented. This difference can be explained by the different worldview of Hindu yogis and Buddhist monks. In the philosophy of Zazen, the person tries to achieve full awareness of every moment whereas in Hindu philosophy, the outside world is perceived as *maya* (deception) and should not be regarded.