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What is an altered state of consciousness?

Antti Revonsuo, Sakari Kallio and Pilleriin Sikka

"Altered State of Consciousness" (ASC) has been defined as a changed overall pattern of conscious experience, or as the subjective feeling and explicit recognition that one's own subjective experience has changed. We argue that these traditional definitions fail to draw a clear line between altered and normal states of consciousness (NSC). We outline a new definition of ASC and argue that the proper way to understand the concept of ASC is to regard it as a representational notion: the alteration that has happened is not an alteration of consciousness (or subjective experience) per se, but an alteration in the informational or representational relationships between consciousness and the world. An altered state of consciousness is defined as a state in which the neurocognitive background mechanisms of consciousness have an increased tendency to produce misrepresentations such as hallucinations, delusions, and memory distortions. Paradigm examples of such generally misrepresentational, temporary, and reversible states are dreaming, psychotic episodes, psychedelic drug experiences, some epileptic seizures, and hypnosis in highly hypnotizable subjects. The representational definition of ASC should be applied in the theoretical and empirical studies of ASCs to unify and clarify the conceptual basis of ASC research.

Keywords: ASC; Dreaming; Drug Induced States; Hypnosis; Meditation; Psychosis; State of consciousness

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1. Introduction

The scientific study of consciousness is a challenging domain, not only because of the philosophical "hard" problem involved (how *any* physical thing could have *any* phenomenal properties; see Chalmers, 1996), or the methodological difficulties in measuring or modelling consciousness (Revonsuo, 2001), but also because the basic concepts in this field remain unclear (Revonsuo, 2006). That is, either the concepts have not been defined at all, or the definitions found in the literature are idiosyncratic and controversial. Moreover, the empirical criteria with the help of which it would be possible to identify or observe the phenomena of interest also necessarily remain vague.

One widely used concept that lacks a clear, accepted definition is the notion of an "Altered State of Consciousness" (ASC). On the one hand, the notion seems intuitively intelligible, perhaps because it seems easy to find some relatively uncontroversial exemplars of ASCs, such as dreaming and hallucination under the influence of psychedelic drugs.

On the other hand there are long-winded debates and disagreements concerning some other cases, such as hypnosis: does hypnosis involve an ASC or not? The disagreement does not seem to be purely empirical (i.e., about whether or not some behavioral or neurophysiological effect of hypnosis has been demonstrated) but at least partly conceptual (i.e., about the defining features of ASC and what kind of objective markers should be counted as uncontroversial evidence for an ASC in association with hypnosis (see Kallio & Revonsuo, 2005).

To decide whether an ASC is involved or not in any psychological phenomenon, we would require clear and empirically testable criteria for what counts as an ASC. The criteria should be derived from a theory of consciousness or from a theoretical conception of ASC. The definition of ASC that we arrive at should apply to different kinds of phenomena that have been traditionally and intuitively regarded as ASCs, and it should rule out other psychological phenomena with which genuine ASCs may be confused. Thus, the definition should capture the core idea of an ASC, and describe the necessary and sufficient conditions for a psychological state to count as an ASC.

This kind of conceptual clarification is the first crucial step to be taken in order to systematically describe and explain various ASCs, and to determine empirically whether an ASC occurs or not in connection with some psychological state or process, such as hypnosis or meditation. Furthermore, if the concept of an ASC can be derived from a more general theory of consciousness and its neural correlates, then ASCs could be better integrated with the mainstream cognitive neuroscience and consciousness research. In a recent article Vaitl et al. (2005) provided a review of a wide range of phenomena included under the rubric of ASC. However, the aim of that paper was to describe the neurophysiological, cognitive and biological as well as phenomenological underpinnings of ASCs in the empirical literature rather than developing a theoretical model and definition of ASCs.

In the present paper we attempt to clarify the concept of ASC. We will proceed in this task as follows. We will first clarify the concepts directly included in the notion of ASC: "Consciousness," "State" of consciousness," and "Alteration" of a state of

consciousness. We consider the typical definitions of ASC found in the literature and try to explicate in which way these terms are used. We analyse the strengths and weaknesses associated with the traditional definitions of ASC. Then we put forward a new proposal as to how the notion of ASC should be defined: The representational definition of ASC. We evaluate the strengths and weaknesses of this conception as well, and show whether it succeeds in classifying a wide variety of psychological states as ASCs or not.

2. How to Understand "Consciousness" in the Notion of an ASC?

There are (at least) two different ways to understand the notion of "consciousness" in "altered state of consciousness." The first is called "primary phenomenal consciousness" (cf. Block, 1995, 2001; Farthing, 1992). It refers to subjective experiences *per se*; to the mere *presence* or the simple *having* of subjective experiences (Revonsuo, 2006). Primary phenomenal consciousness consists of patterns of subjective experience or qualia: sensations, percepts, emotions, body image, mental images, and inner musings. It includes the immediate phenomenal contents of consciousness as such. The second notion of consciousness is called "reflective consciousness" (Block, 2001, Farthing, 1992). It is dependent on primary phenomenal consciousness, because reflective consciousness requires that we focus on some particular phenomenal content and *select* it as *input* for *further* conscious processing, such as naming, categorizing, judging, evaluation, or choice of the next course of action (Revonsuo, 2006). In other words we take something from primary phenomenal consciousness as an object for further conscious reflection or reflective thought. In the traditional terminology of cognitive psychology, selective attention and working memory are involved.

This distinction between the two different meanings of "consciousness" is crucial when the notion of ASC is defined. Farthing (1992) defines ASC in the following way:

> An altered state of consciousness may be defined as a temporary change in the overall pattern of subjective experience, such that the individual believes that his or her mental functioning is distinctly different from certain general norms for his or her normal waking state of consciousness. (p. 205)

Tart (1990) gives the following definition:

> An altered state of consciousness for a given individual is one in which he clearly feels a *qualitative* shift in his pattern of mental functioning, that is, he feels not just a quantitative shift (more or less alert, more or less visual imagery, sharper, duller, etc.), but also that some quality or qualities of his mental processes are *different*. (p.1)

According to these definitions, both primary phenomenal consciousness and reflective consciousness must be involved for something to count as an ASC. In primary phenomenal consciousness there is *a changed pattern of subjective experience*, in reflective consciousness a *cognitive judgement* must be passed to the effect that the pattern of experience is *subjectively recognized as* somehow crucially different from normal.

In hypnosis research, a clear, accepted definition of the concept of an ASC would be particularly helpful. An ongoing fervent debate focuses precisely on the notion of an ASC. The crucial question is this: when a person is ''hypnotized,'' is there an ASC involved or not?

In the context of hypnosis, Kirsch (2005) states that:

> State and nonstate theorists agree that hypnotic suggestions can produce altered states (i.e. the subjective experience of amnesia, analgesia, involuntariness, etc.). (p. 18)

Kihlstrom (2005) has further explicitly added the involvement of reflective consciousness as a crucial element of a definition of an ASC when he states that:

> Introspective self-reports of changes in subjective experience seem to be central to the definition of any altered state of consciousness. (p. 35)

What seems to be in common with these definitions is that there has to be a change in the content of consciousness (change in primary phenomenal consciousness) and at least an implicit assumption that the person being in an ASC should somehow recognize this and be able to give introspective reports about it (involvement of reflective consciousness).

Shapiro (1977) argues that a changed overall pattern of experience is not sufficient for a psychological state to count as an ASC. In addition to a change in the subjective level of experience, a changed pattern at the objective neurophysiological level is also required. The underlying idea in this proposal seems to be that introspective verbal reports concerning changed subjective experiences are not sufficient, unless they can be objectively confirmed by converging evidence from the neural levels.

Thus, we arrive at three potential definitions of an ASC:

> Definition 1.1: ASC as a state in primary phenomenal consciousness. ASC is defined by the changed (overall) pattern of subjective experience in primary phenomenal consciousness.
>
> Definition 1.2: ASC is a phenomenal state in primary phenomenal consciousness and the corresponding cognitive state in reflective consciousness. ASC is defined by the changed (overall) pattern of subjective experience in primary phenomenal consciousness, coupled with the cognitive recognition of the change at the level of reflective consciousness, and classification of the experience as altered.
>
> Definition 1.3: ASC is a psychological state and a neural state. ASC is defined as above in 1 or 2, but in addition to that, a corresponding altered pattern of neural activity must be involved and objectively detected.

3. Strengths and Weaknesses of the Definitions

According to Definition 1.1, ASCs are altered overall patterns of experience in primary phenomenal consciousness. While this sounds plausible, the definition does not specify any specific criteria as to how we should differentiate a ''normal'' state (i.e., a ''normal'' overall pattern of experience) from an ''altered'' state (i.e., changed

overall pattern of experience). How much different should the patterns be? In what way different? And different compared to what norm or baseline?

One obvious way to define ''normality'' would seem to be something like statistical probability or frequency of the conscious state/content in question. ''Normal'' states of consciousness would consist of the ''average'' or ''typical'' types of patterns of phenomenal experience that dominate experience most of the time (perhaps the norms would have to be separately established for different groups and cultures). ''Altered'' states could be defined as extremely infrequent, improbable, rare, exceptional, or atypical patterns of subjective experience.

The weakness of this approach is that it would imply that it is impossible to have exceptional contents of consciousness while in the normal state of consciousness, and vice versa. Counterexamples to such a definition would be easy to come by (e.g., dream experiences with mundane content would not count as ASCs whereas highly unusual perceptual experiences in an exceptional but real situation would count as ASCs).

Definition 1.2 can overcome such difficulties by adding the further criterion that the experience must *feel* altered emotionally, and it must be cognitively *recognized as* altered, in reflective consciousness, either while it is happening or immediately after it.

We argue that the subject's own judgement in reflective consciousness—either concurrent with the experience or inferred after the experience—cannot be a *necessary* condition for an ASC for the simple reason that ASCs may well occur without the subject having any idea, either at the time of the experience or later, that he or she is or was in an ASC. In fact, during dreaming we very rarely have any idea that we are in an ASC. Drug-induced hallucinations may be experienced without the subject suspecting anything or recognizing anything unusual in his or her consciousness. Psychotic hallucinations and delusions experienced during a psychotic episode are firmly held as real even if outsiders try to explain the person that the peculiar experiences are due to a pathological ASC. Thus, reflective consciousness often fails to correctly categorize an experience as altered even when it clearly is so.

And conversely, at least sometimes reflective consciousness mistakes a normal state as an altered one. When something far out of the ordinary happens unexpectedly, say, one personally witnesses a massive catastrophe such as the 9/11 attacks in New York, people tend to experience that what they are perceiving cannot be true, but only a horrible nightmare or a hallucination, and they expect to wake up from it any moment. Thus, when we perceive extremely unusual real events, we are easily led to believe that it is not the world that has changed so very drastically as our perception suggests. Our reflective judgement comes to the conclusion that it must be something wrong with our own perceptual and mental faculties: we must be experiencing an ASC.[1]

All in all, the subject's own judgement as to whether he does or does not have an ASC is not a reliable criterion for identifying the presence or absence of an ASC. The subject's own judgement cannot be either a *necessary* nor a *sufficient* condition for having an ASC, because sometimes we may not believe that we are in an ASC when in fact we are, whereas at other times we may believe that we are in an ASC when in fact we are not.

Definition 1.3 suggests that neuroscientific evidence might resolve the question of whether there is an ASC or not, if the purely psychological evidence falls short. Although the proposal to seek converging neural-level evidence is reasonable as an empirical criterion, it fails to provide us with a definition of ASCs or the empirical criteria for detecting an ASC because it does not specify what *kind* of changed patterns either at the psychological or the neurophysiological level count as the lower-level constituents of an ASC (and what does not). Thus, it is not helpful to define an ASC as an altered state of neural activity, unless the nature of the neural-level alteration can be precisely specified.

Thus, we reject all of the above definitions, and will put forward a new proposal for a definition of an ASC in the latter part of this paper.

4. What is a "State" of Consciousness?

In order to be able to define what exactly it is that is supposed to be altered in an ASC we need to analyze what counts as a "state" of consciousness, and how different "states" are individuated and distinguished from each other.

One rather common way of using the concept "state" seems to be prevalent in the philosophy of mind, where the vague notions "mental state" and "brain state" are often used. Churchland (2002) seems to apply this usage to the notion of "conscious state" when she writes:

> First in the set of prototypically conscious states are a range of *sensory perceptions*, such as seeing a bird fly, feeling the pain of a burn, hearing a police siren. . . . Second, we can include in our list states that are not usually considered sensory experiences . . . This list includes such states as *remembering* what you had for breakfast, *knowing* that you can ride a bicycle, *imagining* a six-legged dog, *attending* to the feeling in your big toe . . . Likewise, *emotional states* such as feeling fear, anger, sadness, and elation, as well as *drive states*, such as hunger, thirst, sexual desire, and parental love belong on the list. (p. 133)

If all of these are distinct conscious states, then the total number of different conscious states must be enormous. If there are countless different states of consciousness what then could constitute a "normal state" or an "altered state" of consciousness?

The problem with this notion of "state of consciousness" is that the different states are individuated merely by the different *contents* of consciousness (or by the different cognitive operations that process those contents). Seeing a bird fly, hearing a police siren, imagining a six-legged dog, feeling fear: these are particular *contents* of consciousness or different *patterns of subjective experience* in primary phenomenal consciousness.

If we regard such experiences as different *states* of consciousness rather than different phenomenal contents of consciousness then it's difficult to distinguish the notion of "state" from the notion of "contents." A state of consciousness would be defined by its phenomenal contents being nothing over and above the temporary

contents of consciousness at a particular moment. Instead we suggest that a clear distinction must be drawn between the *overall state* of consciousness and *the particular phenomenal contents* of consciousness.

We distinguish three different alternatives for defining what is a "state" of consciousness:

> Definition 2.1: Every distinct mental state defined by its *particular* content (or its intentional object) and by its mode (remembering, attending, hoping), if conscious, is a distinct state of consciousness. Thus, seeing a bird fly and seeing a dog run count as two distinct states of consciousness.

This definition corresponds with the "state = content" notion we rejected above.

> Definition 2.2: Every distinct *total* pattern of subjective experience is a distinct state of consciousness. It is the global organization of the overall contents of consciousness at some moment (sensation, perception, emotion; the overall sensory-perceptual "world" in consciousness), not the specific contents of consciousness. If the overall patterns change and their organization breaks down, then it can be counted as an altered state.

This definition implies the purely phenomenally-based notion of an ASC that we have already discounted by rejecting definition 1.1, in which ASC was defined as a changed pattern of experience in phenomenal consciousness.

> Definition 2.3: The "state" of consciousness is defined not by the contents or patterns of experience as such, but by their *relations* to the surrounding context in which the contents or patterns of experience occur.

We have by now rejected all but the last option. Below, we will discuss why the latter serves as the most useful definition for the notion of an ASC. Our ideas can be summarized as follows:

> (1) The normality or alteration of a state of consciousness must include criteria other than the contents of phenomenal consciousness *per se*, and the reflective recognition or judgement of the subject based on the contents of phenomenal consciousness. It must include a reference to the world (or, more precisely, to [world-consciousness] relations). The notion of "alteration" is to be interpreted as a *representational* or *relational* notion, not a purely phenomenal notion.
>
> (2) The "state" of consciousness includes something over and above the patterns of subjective experience: it includes the nonconscious causal-mechanical context in which the phenomenal contents of consciousness are brought about, or the nonconscious mechanisms of representation in the brain that mediate [world-consciousness] relations.

In the rest of the paper, we will elaborate on these ideas.

5. The Representational Concept of ASC

The notion that underlies our intuitive idea about a "normal" state of consciousness is not a statistical notion nor a subjective judgement of normality, but a

representational notion. That is, when the normality of the contents of primary phenomenal consciousness are assessed, *the criterion for their normality is partially external to those experiences*. The phenomenal contents of consciousness function as representational vehicles; they inform the system about something or other that lies outside the boundaries of its immediate subjective experience: in perception, about states of affairs surrounding the person, in bodily sensations, feelings and emotions, about the organism's internal physiological processes and states; in mental images and memories, about the person's future plans or past experiences. The criterion of normality is the fulfillment of the informational function: when the vehicles of conscious representation carry accurate information, they are in the normal state, but when they do not, an ASC may result.

The representational relations that the phenomenal contents of consciousness bear, are [world-consciousness] relations, but here "world" refers not only to the external environment but also to the nonconscious biological and cognitive events and entities inside the organism but outside the sphere of phenomenal experience in the brain (e.g., long-term memory).

5.1. The Normal State of Consciousness

Now we are in a position to define a *normal* state of consciousness: it is a state of the mechanisms of conscious representation in the brain. In the normal state, the mechanisms of representation carry accurate information from "world" to consciousness. The overall contents of consciousness thus accurately represent the surrounding "world." In the normal state of consciousness, primary phenomenal consciousness contains patterns of subjective experience that represent the world and the organism in ways that are functionally accurate representations of aspects of the world/organism.

5.2. The Altered State of Consciousness

It follows from the above that to be in an *altered* state of consciousness is to *deviate* from the natural [world-consciousness] relation in such a way that the world and/or self tend to be *misrepresent*ed. The resulting misrepresentational state is not the functional, original or permanent state of the organism's consciousness, but caused by some external or internal change to the organism's biological makeup that alters the representational [world-consciousness] relations.

Note that it is not the contents of consciousness *per se* that define whether a state is "normal" or "altered" but its *relation* to the world. Thus, in an altered state, *consciousness relates itself differently to the world*, in a way that involves widespread *misrepresentations* of the world and/or the self.

The notion of representation that we apply here is the standard notion widely used in the philosophy of mind and cognitive science (see e.g., Dretske, 1995; Tye, 1995). It can be briefly defined in the following way: the pattern of subjective phenomenal experience in primary phenomenal consciousness *represents* the presence of an external object or event Y in the world surrounding consciousness if and only if the

subjective pattern *reliably indicates* the presence of Y, or *causally covaries* with the presence of Y.[2]

Our notion of misrepresentation can be easily derived from the above: primary phenomenal consciousness *misrepresents* the presence of an external object or event Y in the world surrounding consciousness if and only if the type of subjective pattern that previously represented the presence of Y, now appears in consciousness without Y being present, or the type of subjective pattern that previously represented the presence of Y fails to appear although Y is present in the world.

To further illustrate our representational view of ASCs, consider primary phenomenal consciousness as part of the information channel between the world and the brain: the brain is being informed by the events and entities in its surroundings through many channels, and a part of these channels is phenomenal consciousness or the conscious representation of the world. Primary phenomenal consciousness is the output domain of the [world-consciousness] information channel, and patterns of phenomenal experience reliably indicate and causally covary with the presence of various events and entities outside consciousness.

There are different ways in which misrepresentations might come about in this system. As an analogy of visual consciousness, consider a digital camera. The small liquid crystal display (LCD) at the back of the device is an output domain of the [visual world-camera] information channel: whatever appears on the LCD, reliably indicates and causally covaries with what visible objects and events there are in the external physical space in front of the camera. But if something goes wrong and the representational relation no longer holds, something has changed in the information channel. Either the representational mechanisms in the information channel between the lens and the LCD malfunction, distorting the information in some way so that the picture that emerges is a misrepresentation of the environment. Or there is something wrong with the physical mechanism of the LCD itself: it cannot display the outputs from the information channel properly, although the information it receives is not misrepresentational in itself. Thus, the representational mechanism can be divided to two parts: the information channel preceding the output domain and the physical mechanism of the output domain itself. We call the first the *immediate etiological mechanism* of the visual representation, and the latter, the *constitutive mechanism* of the visual representation.

Applied to consciousness, the nonconscious information channels from the senses that carry informational content towards consciousness are called the *immediate etiological mechanisms of conscious representation*, whereas the neurophysiological micro-level mechanisms that directly underlie primary phenomenal consciousness in the brain are the *constitutive mechanisms of conscious representation*.[3]

Now we are finally getting to the point: *the "state" that is altered* in an ASC is *the state of the mechanisms of conscious representation*. When those mechanisms are altered in such a way as to *misrepresent* rather than *represent* the world, then the person is in an ASC. An ASC is by definition *a state of the mechanisms* of representation in the brain resulting in a *global misrepresentational organization* of the

overall contents of consciousness *at some moment* in relation to the surrounding ("world") context (in which they occur).

Therefore, in our view an ASC should not be defined as an altered *phenomenal* state of consciousness, but an altered *representational* state of consciousness. It is not necessarily the phenomenal surface itself that is altered, but the context in which the phenomenal surface emerges: the preconscious or nonconscious *background* mechanisms of consciousness. By looking at the phenomenal experience per se we cannot know whether there is an ASC or not.

In addition to being an altered state of mechanisms (as opposed to contents), the definition refers to the globality or generality (as opposed to specificity) of the misrepresentation. Because the underlying mechanisms are altered, the misrepresentation is not (necessarily) restricted to any specific sensory, cognitive or affective processes/contents but involves the combination of those. This requirement distinguishes ASCs from other, specific misrepresentational conditions. Domain- or modality-specific hallucinations, perceptual dirstortions, or content-specific delusions may be symptoms of neurological or psychiatric disorders, but they do not as such count as ASCs, because the subjects are not in a globally misrepresentational state. They are in the NSC, but there is some localised pathological process in their mind-brain that produces highly specific misrepresentations.

Furthermore, the definition of an ASC refers to the temporary (as opposed to permanent) nature of alterations in the representational mechanisms of consciousness. The altered state commences at some specifiable time-window, and the normal state of consciousness and brain returns at some later time. This requirement is in harmony with our intuitive ideas of ASCs because it is not a certain (permanent) pathological neuropsychological or psychiatric disorder per se (schizophrenia, bipolar disorder) that involves an ASC but the specific symptoms or psychotic episodes that are associated with these disorders.

It follows from our representational conception of an ASC that to objectively determine the presence of an ASC, one must show that the background mechanisms of conscious representation in the brain are altered in a way likely to lead to (globally and temporarily) misrepresentational content in phenomenal consciousness. This alteration could conceivably be detected at a purely cognitive level, if there is some behavioral test or introspective data collection method that can unambiguously reveal it (see e.g., Kallio, Revonsuo, Hämäläinen, Markela, & Gruzelier, 2001) or at the neurophysiological level, if some brain sensing or imaging methods can reveal that some mechanisms (possibly of conscious representation) are activated differently than in the normal baseline state (e.g., Fingelkurts, Fingelkurts, Kallio, & Revonsuo, 2007a, 2007b; Kallio, Revonsuo, Lauerma, Hämäläinen, & Lang, 1999).

It is another question altogether as to how the two conditions could be empirically distinguished from each other at the neural level. To do that an empirically testable model of the neural basis underlying the normal or baseline representational mechanisms is required. From such a model, it may be possible to derive the objectively measurable cognitive and neural markers of abnormal representational

mechanisms which could then serve as the objective markers for the presence of an ASC. Although our definition of an ASC does not provide an explanatory model of how the mechanisms underlying the normal, baseline representational state of consciousness change so as to bring about a misrepresentational state, it nevertheless offers a framework for where to start looking for such an alteration in the brain.

As stated above, it is not the phenomenal contents per se but the context in which the phenomenal experience emerges that defines whether a person is in an ASC. Hence, the neural activity underlying or correlating with the specific contents of consciousness, such as the sensory information (e.g., visual content), affective information (e.g., negative emotional content) and cognitive information (e.g., memory) cannot inform us whether the specific contents are representational or misrepresentational. For example, if a person reports seeing an angry dog and we measure brain activity in the higher cortical visual areas corresponding to the content of reported visual perception and in subcortical emotion-related areas (amygdala) corresponding to the emotional content of the reported stimulus we cannot distinguish based on the brain activity alone whether the person is actually seeing an angry dog, having a mental visual image of it or having a psychotic or hypnotically generated hallucination.

What is important is how the contents are integrated to an overall pattern of experience and related to the surrounding context (''world''). This, together with the second requirement of our definition—the globality or generality of the misrepresentation—should guide our attention to brain areas that integrate the information about the external (sensory) and internal (cognitive, affective) environment, evaluate this in a contextually significant manner so as to eventually determine the response or behaviour of an organism. Having extensive reciprocal connections to virtually all cortical and subcortical structures, the prefrontal cortex (PFC) is in an ideal position to integrate, monitor and manipulate higher cognitive processes and has thus been implicated as the seat for this kind of executive control (see Pessoa, 2008 for a recent review). PFC is a heterogenuous structure with its subregions engaged in different higher executive functions but a key role at the top of the executive hierarchy has been attributed to the lateral areas, especially to the dorsolateral PFC (dlPFC), achieving this through large-scale cortico-thalamic and cortico-cortical inhibitory modulation by discrete neurochemical systems. Indeed, whereas changes to specific lower-level brain areas lead to specific distortions, such as injury to the visual association cortex may result in visual hallucinations, damage to the dlPFC may result in a variety of sensory, affective, cognitive and executive disorders (Fuster, 2001).

Finally, the third requirement underlying our definition is that the alteration to the state of consciousness is temporary lasting for a limited period of time. This refers to the functional, rather than structural, change in the properties of underlying neural substrates possibly involving alterations in the major neurotransmitter systems. This functional alteration doesn't imply that structural differences in the brain may not contribute to the ASC. In addition to its intrinsinc properties, the functions of a given cortical area are determined by its intrinsic and extrinsic connections so it may

well be that because of their structural brain differences some people are more likely to have alterations to neural mechanisms underlying the normal state of consciousness and hence more prone to experience ASCs. But what determines whether a person is in an altered state is not the change in the 'connectional fingerprint' but in the 'functional fingerprint' (Passingham, Stephen, & Kötter, 2002) of brain areas underlying the emergence of an ASC.

Therefore, a change in the functional fingerprint of the PFC (especially the dlPFC) may lead to (globally and temporarily) misrepresentational content in phenomenal consciousness and hence distinguish a normal state from an altered state of consciousness. Findings from studies of schizophrenia (see Ragland, Yoon, Minzenberg, & Carter, 2007 for a recent review), dreaming (e.g., Maquet et al., 1996), and hypnosis (e.g., Fingelkurts et al., 2007a, 2007b) are providing increasing support for this hypothesis.

6. The Representational Account of ASCs at Work

How well does the representational definition of ASCs handle the prototypical cases of altered consciousness? Here we list a variety of psychological conditions that may or may not be considered as ASCs. We show that the representational account of ASCs gives the conceptual grounds for classifying them correctly.

6.1. Sleep with and without Mental Contents

When a person falls asleep, any contents of consciousness (sleep mentation, hypnagogic imagery, dreaming) globally and reversibly misrepresent reality. Therefore *sleep with any kind of mental contents at all is an ASC*. When sleep mentations engage our minds, we lose contact with reflective thought (we are not aware that we are sleeping), with memory (we do not remember that we just went to sleep), with the reality-status of our experience (we are typically not aware that what we experience is a hallucination or a delusion, and we are unaware of our real surroundings).

However, deep sleep without any contents of subjective experience is properly called a nonconscious state rather than an ASC.

6.2. Hypnosis

Does hypnosis involve an ASC? If the hypnotic induction changes the background mechanisms of consciousness in a way that increases the probability of different kinds of hallucinations and delusions in response to verbal suggestions, then hypnosis does involve an ASC, as the state-theories suggest. If hypnosis only involves voluntary mental imagery but no changed background mechanisms, then it would not count as an ASC, it should rather be characterised as mental imagery combined with social role playing within the NSC, exactly as the non-state views propose. The question can now be empirically solved by looking for evidence of a globally

misrepresentational state in hypnosis, potentially involving hallucinations in different modalities, delusions, and memory distortions. Such a state seems to come about in hypnotic virtuosos after a hypnotic induction is given to them, as they consequently experience strong and multiple changes in conscious experience in response to various hypnotic suggestions.

6.3. Posthypnotic Suggestions

A posthypnotic suggestion is a suggestion given to the subject during hypnosis (thus, during an ASC), but its effects on experience or behaviour are manifested only afterwards when the subject is no longer ''hypnotized.'' The posthypnotic suggestion can trigger amnesia for a specific word, or a strong urge to carry out a certain action, and also amnesia for the fact that this suggestion was given. Does the subject thus enter an ASC when the response to the posthypnotic suggestion suddenly emerges into normal waking behaviour? Or is it sufficient to say that at the time when the suggestion was implanted, the subject was in an ASC, but not when the effects of the suggestion were later triggered?

The post-hypnotically surfacing misrepresentation was originally created and implanted when the subject was in an ASC, but it lay dormant until the appropriate trigger released it in the NSC. Thus, the ASC is only associated with the *creation* of the misrepresentation, because the generation of misrepresentations is possible only during an ASC. Furthermore, during the ASC, it is possible to implant a wide variety of misrepresentations, just because the ASC as a globally misrepresentational state allows the generation of almost *any* kind of misrepresentations. However, once the specific misrepresentation is implanted into the brain, it can be activated by an external cue even within the NSC. When this activation happens, the subject is not in a globally misrepresentational state, thus, there is no ASC at that time. There is only a highly content-specific single misrepresentation that becomes activated. Our representational account can thus handle posthypnotic suggestions by identifying an ASC with the tendency to create a wide variety of misrepresentations globally rather than with the reactivation of specific misrepresentations created and implanted within a previous ASC.

6.4. Meditation

Meditation may lead to an ASC, where the sense of the self disappears or where the meditator has visual hallucinations of light, profound mystical experiences, etc. However, an ASC during meditation is an exception rather than a rule: most of the time consciousness during meditation can be fully described and explained by referring to concepts such as attention, concentration, relaxation, inner imagery and speech, and absence of sensory stimulation. Only if wide-ranging misrepresentations take place during meditative experience has the meditator entered an ASC.

6.5. Higher and Mystical States of Consciousness

There are many ASCs that are considered positive, desireable, and ''higher'' states of consciousness, such as flow, cosmic consciousness, and enlightenment. Although highly positive and desirable, they typically involve misrepresentations. One defining feature of a flow state is the distorted sense of time and self. When in flow, hours feel like minutes. Or one may feel tireless and powerful despite objective evidence to the contrary (e.g., runner's high when running a marathon). In mystical states, there are delusions of special importance and grandieur; beliefs about a special contact with God or the Universe, special knowledge gained through such mystical subjective channels, and distortion of the sense of time and the sense of self. Also, hallucinations of travelling through the cosmos, or of seeing the whole world or god or eternity etc. may be involved. Thus, despite their intensely positive emotional tone and significance for the subject, these states are ASCs insofar as they tend to induce a variety of misrepresentations for the subject's conscious experience.

6.6. Visual Hallucination: Charles Bonnet Syndrome

In this rather common neurological syndrome of unknown or unclear neuropathological origin in the elderly, the patient has intermittent but vivid, lifelike visual hallucinations from simple patters to complex scenes. The hallucinations are usually different for each patient, but quite stable across time within each patient. Initially, the hallucinations might be mistaken for real objects, but usually the patient learns to distinguish the hallucinations from reality. There are no psychiatric symptoms such as delusions involved, and no hallucinations in other modalities. Is the Charles Bonnet patient in an ASC when he or she hallucinates? The hallucinations are surely misrepresentations of reality. Still, the *overall* tendency of the background mechanisms of consciousness to produce hallucinations has not changed: the hallucinations are very limited and predictable in content. Thus, Charles Bonnet Syndrome is not an ASC, because it fails to fulfill the globality of misrepresentation; it is caused by an altered activity in only content-specific visual modules, not an overall altered state in the background mechanisms of consciousness. Unlike in dreams, hypnosis, hypnagogic state, etc., where the probability to produce misrepresentations has increased overall and the misrepresentations show rich variability in content (visual, auditory, bodily hallucinations, memory distortions, delusions, etc), in Charles Bonnet syndrome the probability to produce other than specific visual misrepresentations has not increased.

6.7. Epileptic Seizures

During some epileptic seizures (e.g., simple or complex partial seizures in temporal lobe epilepsy) the patients experience a rich variety of illusions, hallucinations, delusions, and the loss of physical and mental control. Also total loss of consciousness may occur, as well as automatic behaviours and confusional states (see Johanson, Revonsuo, Chaplin, & Wedlund, 2003; Johanson, Valli, Revonsuo,

Chaplin, & Wedlund, 2008; Johanson, Valli, Revonsuo, & Wedlund, 2008). The seizures are temporary and reversible. Thus, at least some epileptic seizures fulfill the representational definition of an ASC.

6.8. Psychotic Episodes

Psychotic episodes typically include (bizarre) delusions, paranoia, derealization, depersonalization, and hallucinations in auditory and visual modality. Thus, psychosis potentially involves a wide variety of misrepresentations, and fulfills the criterion of a global misrepresentational state. Indeed, the very definition of psychosis refers to the fact that the patient is out of touch with reality. The only point that might exclude psychosis from the list of ASCs is the question whether it is a reversible or a permanent pathological state. In any case, at least temporary psychotic episodes do fulfill all the criteria for an ASC according to the representational definition of ASC (globality and reversibility). Note that this is true despite the exact underlying cause or the category of a psychiatric disorder. The psychiatric diagnostic labels (schizophrenia, major depression etc) as such should not be classified as ASCs or not. Only the psychotic episodes, had by any kind of patients, can be ASCs.

6.9. Other ASCs

Hallucinatory and delusional states caused by psychedelic drugs, heavy alcohol intoxication, sensory deprivation, and other causes: all of these fulfill the definition of an ASC as a general but reversible misrepresentational state of the mind, where the background mechanisms of consciousness tend to misrepresent reality in a variety of ways.

All in all, the representational notion of ASCs seems to be a useful way to identify a distinct phenomenon in the brain-mind that manifests itself in various forms and conditions, but all its varied instantiations nevertheless share a common core: the generally increased tendency to produce misrepresentations for conscious experience.

7. Conclusions

We argued that the definition of the concept of an ASC should not be based on changes in the pattern of subjective experiences *per se* (phenomenal consciousness) nor on introspective thoughts and reports of detected changes in subjective experiences (reflective consciousness), because these definitional criteria potentially leave out some obvious ASCs, or include some states that obviously should not be counted as ASCs.

As an alternative solution to the definitional problem we propose that a clear distinction must be drawn between the overall state of consciousness and particular phenomenal contents of consciousness. The overall state of consciousness includes something over and above the patterns of subjective experience. It involves the nonconscious causal-mechanical context in which the phenomenal contents of

consciousness are brought about. The mechanisms of representation in the brain that mediate [world-consciousness] relations play a crucial role in ASCs: the critical alterations take place there: the [world-consciousness] relations are altered in ASCs.

The notion of an ASC is, we propose, the notion of a state of the nonconscious neurocognitive background mechanisms of consciousness. In this state the background mechanisms tend to produce misrepresentational contents of consciousness such as hallucinations, delusions and memory distortion. The effects of the background mechanisms are global or general: an ASC is a globally misrepresentational state. The state is also only temporary and reversible.

The application of our definition of ASCs requires only that we obtain behavioural evidence (such as subjective verbal reports) about the contents of consciousness and can determine whether the contents have become misrepresentational or not. The cognitive mechanisms underlying the ASC however also have their objective lower-level neural basis where the corresponding changes must have taken place. To ascertain that an ASC is present, these neural changes should also be objectively detected. The definitional features and the paradigm cases of ASCs (dreaming, psychotic episodes) suggest that the neural mechanisms of ASCs involve functional alterations in the major neurotransmitter systems (probably at the level of the prefrontal cortex).

To base the future empirical neurocognitive research on ASCs on a clear conceptual ground, we propose that the representational definition of ASCs should be applied. This concept could guide fruitful empirical research on ASCs in cognitive neuroscience and help to resolve old controversies, such as the state-nonstate debate in hypnosis research (Kallio & Revonsuo, 2003).

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Notes

[1] It could also be argued that the subject is in such a case having an ASC called ''derealization.'' This would be a state where everything seems unreal, distant, and dreamlike, as if not really happening. This state is quite interesting from the representational perspective, because the subject is representing the events of the world correctly, but simultaneously has a strong feeling or belief that these representations must in fact be misrepresentations. Thus, derealization is a kind of ''meta-ASC'' the content of which concerns the representational accuracy of one's own consciousness. Still, the subject's own judgement remains ambiguous as to what is going on, and therefore proves the point that the subject's own reflective judgement cannot be the criterion for an ASC.

[2] However, we do not in general wish to defend a representational theory of consciousness, only a representational definition of an ASC. Our metaphysical theory of consciousness is biological realism; see Revonsuo, 2006.

[3] For further details on this multilevel view of consciousness, see Revonsuo, 2006.

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