Valuation Theory: An Environmental, Developmental and Evolutionary Psychological Approach *

Implications for the Field of Environmental Education

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TEORIA DELLA VALUTAZIONE: UN APPROCCIO PSICOLOGICO AMBIENTALE, EVOLUTIVO ED EVOLUZIONISTICO. IMPLICAZIONI IN CAMPO EDUCATIVO

Abstract

In this paper, we propose a new approach to motivation theory based on a cognitive perspective: the concept of valuation. Motivation and valuation are reviewed and discussed here using an environmental, developmental and evolutionary perspective. We argue that

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motivation could be approached as one of the various mechanisms that compose cognitive processes, being related to the adaptive value of objects, situations, or settings. Motivation and valuation are proposed as markers of the survival value of perceived, imagined, or conceptualized objects of cognition. In this manner, motivation can be conceived as the product of a complex cognitive computation that determines the adaptive value of our cognitions, and provides an evaluative response. From this perspective, we discuss the perceptual, cognitive, and symbolic dimensions of the valuation process. Finally, we discuss the implications for possible future developments of basic and applied research in the domain of environmental psychology and environmental education.

Keywords: Cognition, Environmental education, Environmental psychology, Motivation, Perception, Valuation.

1. Introduction

Accounting for human and non-human behaviour has been one of the aspirations of the thinkers of all times. At the end of 19th century, the approach shifted from philosophical enquiry to a scientific approach, centred on empirical investigation and systematic verification. From the second half of the 20th Century, the cognitive perspective has been identified as the most successful and accepted means for explaining social behavioural processes of different species, including humans (Chomsky, 1959; Neisser, 1967; Anderson, 1985; Eysenck, 1990)

Within this frame, behaviour has been explained mainly in terms of cognition and motivation. Cognition is the explanation of how individuals establish contact with reality and construct representational worlds that operate in reality; motivation is what leads organisms to choose certain courses of behaviour over others.

In this paper, we offer a new approach to motivation theory, based on a cognitive perspective: the concept of valuation. Motivation and valuation are reviewed and discussed according to an environmental, developmental and evolutionary perspective. We do not aim to criticize the previous literature in this field, but rather to reinterpret part of its main findings, using an applied perspective. We argue that motivation could be approached as one of the various mechanisms that compose cognitive processes, being related to the adaptive value of objects, situations, or settings. It can be seen as a marker of the survival value of perceived, imagined, or conceptualized objects of cognition. From this perspective, it is a cognitive dimension, similar to perceiving or understanding any dimension, such as size or the brightness or loudness of a stimulus. In this view, however, motivation can be conceived as the product of a complex cognitive computation that determines the adaptive value of our cognitions and provides an evaluative response. This computation may be either innate, or learned through experience.

Starting from the concept of valuation used by classical authors to explain motivation (Lewin, 1936; Kelly, 1955; Beck, 1964), we propose a theoretical schema that aims at explaining this concept using three levels of processing: perception, imagination and abstraction. Our proposal identifies a valuation dimension for each one. We also discuss the process of phylogenetic evolution, which goes through these three levels, and that ontogenetic development, at least in humans, re-enacts this sequence, from perception, to imagination to abstraction. This is consistent with the levels and stages proposed by developmental psychologists adopting an individual (e.g., Piaget, 1954) or socio-constructionist approach (e.g., Bruner, 1990). A fundamental concept in the explanation of behaviour is the notion of information, which plays a key role in the explanation of the phylogenetic development of cognition.

While it is true, as Lewin (1951) or Gestalt Theorists have maintained, that animals live immersed in an energetic field (stimulus field), the importance of such a notion is that, as energy carries information from its direct or indirect sources, it is simultaneously an informational field. Consequently, organisms do not respond to the energies themselves (stimuli), but to the information carried by such energies. Therefore, animals, including us humans, live surrounded by an informational field to which they respond.

We argue that a first stage in the development of cognition was the evolution of the capacity to use the information carried by the energies about their source, to form a representation of reality. That is, animal organisms use the information carried by energies, to form a representation of matter's shape, position, movement, type of substance, and energetic state. That perception is the construction of a virtual reality model (representation), related to the surrounding reality itself, using the informational field as the source for that construction process.

A second stage is constructing a virtual reality model when information is no longer available from direct stimuli. That is, when the energies that bring the information from a given source are no longer available, the organism is capable of constructing or maintaining the virtual reality model that was built when the energies were present. This process goes from an extension of the visual perceptual processing to include time dependent processes, like the perception of movement, up to the creative production and manipulation of imaginal representations, generated without reference to a specific previous experience.

Third, virtual reality representations are used to generate abstract ones. This third stage uses the selective attention capacity of animals to generate prototypes that have the common traits of objects, situations, or processes that have essential shared properties. Then, it is possible to operate on such abstract representations, like concepts, to relate them in different ways and generate even more abstract ones, in which the common traits are concepts themselves. That is, the cognitive process known as abstract thinking. This last level also is related closely to language, which is a way of sharing experiences between persons (as it is only present in *Homo Sapiens*), causing the emergence of intersubjective processes and cultures. Albeit different, language and thought strictly are interdependent and related entities, as it was proposed by the historical-cultural and ecological approaches to human development (e.g., Bronfenbrenner, 1979; Vygotsky, 1964). Language is used to convey the other two levels of information processing. Thus, language and discourse in human interaction represents a fundamental aspect to consider for understanding human behaviour and human development (e.g., Potter, 1998 and 2003) especially in current multilingual and multicultural societies (e.g., Pirchio *et al.*, 2015; Pirchio *et al.*, 2017). In the following sections, we examine the developmental processes of these different stages through an evolutionary perspective.

2. Valuation stages in evolution

The development of the nervous system during phylogenetic evolution was related to the heterotrophic way of adaptation of animals, which used information to react to the distribution of matter in their living ecosystems. The evolution of these capacities allowed animals to develop more efficient systems of behavioural control, enabling living beings to move themselves in the pursuit of food and water sources (Williams, 1966). As carnivorous animals and predators evolved, these operations became more complicated, requiring more complex patterns of behaviour and skills, that we commonly define as hunting. The reason for this increasing difficulty and complexity is that prey, which in turn evolved and acquired more efficient movement capacities, were more able to run away, hide, or fight. Thus, the very first animals almost were passive structures, or made of primitive nervous systems that reacted directly to simple stimuli, rather than processing complex information (see also Wilson & Wilson, 2007). Eventually, sensory processes reacting directly to energies became less central and evolved through more complex configurations, requiring more efficient neural structures organizing movement at different cognitive levels (e.g., Wilson, Van Vugt, & O'Gorman, 2008). Consistent with that, complex neural wiring developed to enable the increasingly difficult processing of external information. That was reflected in the capacity of generating virtual models of the reality that surrounded the organism. This also included representations of behaviour (haptic ones), and of the inner states of the organism itself (proprioception).

Once the capacity to adapt behaviourally developed for feeding, then it was used for other purposes. One of them was the control of the inner processes (e.g., Richards, 1987). Animals do not use passive systems to move the fluids inside of them, they use active pumping systems (such as the heart and cardiovascular system, the digestive system, or the lymphatic system). More conscious and motivated behavioural patterns also were developed, and put into the service of other biological processes, but with more social implications (see, for example, recent works on an evolutionary account of leadership in human groups; e.g., Van Vugt, Hogan, & Kaiser, 2008). The first one is reproduction, which instead of using the passive release of masculine gametes to the air, like plants do, used active behaviours that brought them in contact with the feminine ones. Another behaviour that emerged as carnivorous predation evolved, was predator avoidance. That is, the behaviours that helped prey evade being killed and eaten by a predator, such as running away, hiding, or closing ranks in group to face external threats. Caring for the new-born or immature descendants is another aspect that developed. Territorial behaviours also evolved (e.g., Taylor, 1988). These are related to either the caring of food resources or defending mates, in particular, for male individuals (for a more detailed review of the concept of territoriality in human groups see, for example, Sommer, 2004). Finally, the development of complex social behaviour, with all its advantages, evolved and acquired increased complexity during the course of human history (e.g, Van Vugt, 2006).

3. The perceptual stage

In the perceptual stage, sensory memory is important in processing the information required for visual, sound, haptic and olfactory perception (e.g., Hochberg, 1968; Harer, 1970; Phillips, 1974; Näätänen & Winkler, 1999; Wilson & Stevenson, 2003; Pasternak & Greenlee, 2005; Gallace & Spence, 2009). This kind of memory is needed because stimuli act instantaneously and the brain requires time and a buffer to hold the information while it is being processed. Three kinds of sensory memory have been identified: one for vision, one for audition, and one for the haptic system (Sperling, 1960;

Averbach & Coriell, 1961; Eriksen & Johnson, 1964; Bliss, Crane, Mansfield & Townsend, 1966; Neisser, 1967; Darwin, Turvey, & Crowder, 1972). They have been called iconic, echoic, and tactual. Sight is the archetypal sensory system for our species, *Homo Sapiens*, due to the fact that photons show little dispersion, so that sight is an excellent mechanism to provide the information required to build a model of the distribution of matter in space.

The perception of movement and of causality were the first opportunity to use the second level of processing, the imaginal one, to supplement the perceptual construction of virtual reality. Once that a virtual reality representation is constructed, the valuation processes and the interaction with the other processing levels take place. The perception of movement and the perception of causality includes the use of images to retain previous icons, to integrate the process of perception in time. Movement is the displacement of an object in different directions. Gibson (1979) has developed an analysis of the changes of size, shape, and position that objects experience, as they move in different directions. The perception of causality is related to the correct perception of timing in movements and relationships among objects (Michotte, 1963).

The perception of the environment is obtained through the construction of virtual reality models as a way to be able to respond to reality itself. It is an efficient way to adapt to reality, even when the input conveys too limited information. However, it requires a more complex process to extract information to have an adequate representation of the environment. The auditory nervous system processes the incoming information and then uses it to establish patterns. These patterns are virtual reality models of the sound. It allows for the prevention of dangers due to the movement of something (for example, something falling upon you, or a predator or assailant approaching you). The fundamental utility of hearing is that animals produce noises with the aim of communication. Sounds of language are perceived both by the emitter and the person or persons who listen to the communication, if there is any. They allow for the transmission of information in a very efficient way.

The haptic system provides a way of getting information from the objects at the moment of getting contact with them, and also a way of perceiving one's own movements in space. It also serves for the perception of the motor part of emotions, like trembling, for example. Likewise, the proprioceptive system permits humans to become aware of inner states, and thus is related to biological needs like hunger, thirst, and so forth.

Thus, the perceptual system allows organisms to get information to form a model of the surrounding reality, and to adaptively respond to this reality. This reaction is not directly to the reality itself, but mediated by the construction of the virtual reality models, that approximate reality itself, even though, at times there may be discrepancies and contradictions. The perceptual system is advanced enough in most species, and allows them to move easily in, and adapt efficiently to, the environment.

3.1. *Valuation in the perceptual stage*

To be useful, perceptual information needs valuation so that the organism can discriminate its adaptive implications. The solution for this was provided by natural selection by adding a dimension to perception that is the product of a cognitive computation of the adaptive value of what is being perceived. Thus, in the case of the perception of an animal, it is an immediate response, which is the result of a computation of what is being seen is a prey, a predator or an animal without implication for survival.

Some of these computations are innate, for example, the disgust caused by a fetid odour, like excrement or a rotting dead animal, or the pleasure provided by the sweet taste of sugar or honey. For evolution, in terms of natural selection, this may be understood as the selection of this computation as a way to avoid proximity to the bacteria of decomposing organic matter, there being danger of an infection; or the behaviour in which one seeks food with a high caloric value, a source of energy necessary for organisms' functioning.

The pleasure-displeasure dimension, thus, establishes the adaptive value of objects, processes, and situations. Pleasure directs the animal's pursuit of adaptive situations, like food, water, sex, warm environments, comfort, and so forth. However, there are circumstances that make these values accessible or that impede, deplete, or otherwise disrupt the access of positive, or avoidance of negative, values. In these circumstances, it is rewarding to get control. Control depends on the power that the supporting or thwarting processes has, and the power with which the animal is endowed.

For example, all animals, including humans, like to eat or have sex. However, there might be other members of one's own species searching for food or a mate. In this case, what they seek is control over the territory, which has been called territorial behaviour. They drive away potential food depleters or sexual competitors. Thus, the perception of control is an intricate process that requires understanding a complex of relationships. Even though there are some automatic emotional responses, such as the anger and barking behaviour of a dog when someone strange enters its territory.

At the perceptual stage, valuation is subject to processes such as conditioning, contrast, habituation, and imprinting. We argue that what is being transferred from one perception to another, for example, through conditioning, can be defined as valuation, and that the response is part of the emotional reaction to stimuli's valuation. We consider that many of the automatic responses, such as reflexes, are emotional responses of some sort.

Contrast is another process that affects valuation and the related emotional response. A circle alone looks smaller if it is surrounded by a set of other smaller circles. A famous experiment by Bruner and Goodman (1947) show that values affect size perceptions: the perceived size of coins is overestimated compared to their real size, while the same does not occur with neutral cardboard disks. Imprinting was extended by Lorenz (1952) as the way new-born animals create a bond with their mother or to whatever is moving near them.

Perceptual valuation, thus, is the way through which natural selection makes available the capacity for the organism for distinguish between adaptive, non adaptive, and neutral situations. However, it can be devised as a magnitude, and goes from an extremely beneficial level to an extremely harmful one, in a continuous way from one extreme to the other. The quality of this dimension of being graduated quantitatively, makes it likely to be conceived as being a force or an energy in the organism. Its magnitude, however, is perceived as any other magnitude of the environment such as size, speed, saturation of colour, and so forth.

4. The imaginal stage

Another adaptation mechanism is related to the use of the virtual reality model construction capacity that evolved in response to reality in the absence of the direct stimuli and their informational input at the moment of action. This can be seen clearly for vision in the phi phenomenon of the Gestalt Psychologists (see Westheimer, 1999; Steinman, Pizlo & Pizlo, 2000). In a dark room, researchers turned on a light and immediately turned it off, and a few milliseconds later a second light placed somewhat ahead was turned on and off. What subjects saw was not two lights on and off in succession, but a single light moving from one place to another. This is the same method that is used by cinematography and video on TV, where what we see is not a series of snap shots, but a scene in movement. Michotte (1963) studied the perception of causality, which also has to do with the integration of the events in time. If an object moves toward a second one, and then when it touches it stops, and the second one starts moving, what is perceived is that the first one caused the motion of the second. These events are a part of the perception process itself, and the only difference is that the perceiver is using a model to retain the information for comparison with other events that happen afterwards, when the stimulus that brings the information about it is gone already.

Another process for the construction of virtual reality models when the stimulus is gone is related to the creation of expectations. This corresponds to operant conditioning in behaviourist theories. When we do something, usually we receive feedback about our actions; that is, we perceive the results of what we performed. Thus, when we act, we have three phases in sequence: the first is the perception of a situation, the second is the haptic perception of the action, and then the perception of the consequences. This sequence is recovered the next time we face the same situation, through a learning process. It starts when we perceive and recognize the situation, and then we recover the virtual representation of a previous sequence. This retrieval of the image of the action and its consequence is what activates the program for that action. There is some low-level abstraction here, which implies that the response to the situation may be given even if the situations are not identical.

In this way, expectations can be generated by retaining the virtual reality model of a sequence of action, including the perception of causality, and that provides the cognitive system with the necessary information to implement future actions. This type of action can come from very short or complex sequences structured over a large space and time, and with many actions interconnected. What is important is that animals, including people, anticipate the consequences of what they are going to do. Tolman (1948) conceptualized these kind of actions as means-end-readiness, which would be cognitive structures implementing actions for a goal. In this way, we integrate information from perceptual experiences of places, which might include the haptic perceived actions. The same thing is true for other kinds of circumstances. Maps are one kind of schema, which is a virtual reality representation of some aspects of the world, organizing perceptions and actions.

When models and images are kept long enough in consciousness, they pass on to permanent storage, from which they can be retrieved. The retrieval is a process of reconstruction of an image from stored clues. In general, the essential function of memory is to keep alive images that then can be used to guide behaviour, even after information input has gone. We can recover from long term imaginal memory action sequences or operations. Piaget (1954), for example, argued that operations integrate in sequences, and when they turn into integrated systems, they can establish accurate representations of processes or phenomena. These processes also might be seen as an explanation of what has been defined as intuitive thinking, and can account for the mechanisms through which people might solve problems without using abstract conceptual relations. Dual process accounts of impression formation also might be mentioned as compatible with the imaginal stage in the representation and construction of reality (e.g., Brewer, 1988).

4.1. *Valuation in the imaginal stage*

Valuation operates also in the imaginal stage. Values are attributed to situations, expectations, and consequences of actions. The situations or the consequences of actions might have positive (pleasant) or negative (disagreeable) value, and this could be actual, such as getting a reward or a punishment, or expected, such as the withdrawal of a reward or the withdrawal of a punishment. Values also can produce conflicts since there may be opposite values in a perceived situation. These processes were well illustrated in classical experiments by Miller and colleagues (Miller & Murray, 1952; Murray & Miller, 1952), where rats were rewarded with food and later punished with electric shock in the very same place. Approach and avoidance gradients from rewards and punishments were measured using a dynamometer, showing the existence of an asymmetrical pattern in approach vs. avoidance reactions.

Valuation at the imagined level is affected by similar factors as in the perceptual stage such as conditioning, contrast, and habituation, and might be related to working memory and short-term procedural memory, and might be linked to the process through which models are retrieved from memory for specific tasks. Valuation might also be important in relation to creative processes, for example, in the cognitive manipulation of images.

5. The abstract stage

Abstraction is the third and last stage in information processing. This stage is present fully only in *Homo Sapiens*, although other species may have an incipient conceptualizing processes. This level of cognitive processing is considered as the process that mostly makes a difference between human and other species, as it allows for complex representations of reality in abstract terms. Other species, such as chimpanzees, dolphins, octopus, crows, also show skills that may imply the use of abstract thinking, although there still is much debate and controversy over this issue. In line with dual process theories, however, it seems plausible to argue that only humans can engage in the forms of abstract hypothetical thought that underlie many human activities, such as science or literature, and which are connected typically to «Type 2» thinking (e.g., Stanovich, 2011; Evans & Stanovich, 2013).

Abstract thinking is the process of combining abstract concepts to represent the relationships of classes of things in reality. To be able to think abstractly, people have to be able to generate abstract concepts. To be able to think abstractly, people have to attend to specific traits and construct a virtual reality model, the prototype, which includes the most essential common features of a class, using information stored by means of virtual reality models. Concepts, thus, depend on the ability to attend selectively to features of perceived objects and then use the stored imaginal information, to be able to find the features that define a given class. That implies using the capacity to attend selectively to features or dimensions of the reality. Earlier theories in psychology or logic proposed that concepts are defined by establishing rules to determine the members of a category, with well-defined limits. Later on, Rosch (1977) conceptualized the process of concept formation in terms of prototypes, which are defined as exemplars that contain the most typical traits for a given category.

Abstract thinking also is related to language. Language is a capacity that evolved in humans, and which allows the transmission of abstract thinking to other members of the species. Abstract thinking was acquired in the course of evolution, resulting in the ability to construct and use more efficient technologies. Humans needed to plan the construction of tools for their survival, and to understand mutually and share the functioning and the ways to construct them. Instead of simple sequences of expectancies, it might have been more advantageous to have abstract representations of the pertinent principles. To be able to do the task collectively, this understanding had to be shared, leading to the evolution of language. Language, thus, has enabled the human species to have a shared abstract conception of the world. Abstract thinking then might be seen as one of most important of human evolutionary changes, and with language, it made possible the development and transmission of complex cultures. It is also worth noting that international debate on abstract concepts has become particularly hot in the last 5-10 years, also due to the spread of embodied and grounded theories of human cognition. In line with these views, recent evidence suggests that observing objects and actions activates a simulation, and that concrete concepts and words might be grounded in perception and action systems (e.g., Fischer & Zwaan, 2008; Barsalou, 2010; Borghi & Cimatti, 2010; Glenberg & Gallese, 2012; Ostarek & Huettig, 2017).

5.1. *Valuation in the abstract stage*

Valuation in the abstract stage works in relation to language use. Adjectives, for example, are terms that refer to properties that have value. Sometimes the value might be implicit and depend on the understanding of the implications of what has been said. For example, defining nuclear radiation as pertaining to the category of «natural» implicitly conveys a more positive value to nuclear energy, and this operation can be used rhetorically to communicate or to persuade other people about its necessity or acceptability (e.g., Reicher *et al.*, 1993). The valuation attributes of abstract entities, through which we develop abstract value systems, also are linked to language, and this be used as a direct tool for investigation, such as in the well-known semantic differential technique developed by Osgood, Suci and Tannenbaum (1957). This technique may be applied usefully to evaluate abstract concepts, as well as imaginal situations related to them, or direct experiences at the perceptual level.

The abstract valuation process has the potential of storing great amounts of information, which by its property of being abstract, applies to many circumstances. In this level, we have an abstract model of reality, that we use to adapt to it, for example, through long-term semantic memory. The abstract stage also might provide tools for the behavioural regulation, through the emergence of what is known as voluntary control. In this sense, planning and decision making also are related to abstract valuation (e.g., Sugrue, Corrado, & Newsome, 2005). Decision making emerges at the imaginal level when animals become aware of different alternatives of reward, but it is enhanced at the abstract level, with the possibility of representing, more clearly, a wider set of alternatives. It has been suggested that, when making simple choices, humans are able to use statistically optimal decision-making processes, because of an evolutionary pressure to increase the speed and accuracy of decisions, and the likelihood of getting positive rewards for correct choices (e.g., Bogacz, 2007). To reach these rewards, however, alternatives that never have been experienced, or that do not exist, including ideal ones, also can be constructed, such as in forecasting procedures or long-term scenario development exercises. In this sense, planning is important not only for attending specific concrete tasks, but also for deciding what steps have to be taken to get to a desired product, outcome, or state at a more abstract level (see, for example, Gilbert, Gill, & Wilson, 2002).

6. Interactions

The three levels of valuation operate in constant interaction. When we perceive something, we immediately pass it to short term or working memory storage, when we are directly involved and attentive to it; if not, experiences will fade away from consciousness. Attended perceptions get additional meaning from the imaginal and the abstract levels. From the imaginal level, we may retrieve a related memory from episodic long-term storage, or we may activate one or more expectancies. That gives a person the feeling of what can be done with or about the object, experience, situation, or process in question. A given perception may get in contact with one or several classes from the abstract level, and that gives meaning to the perception outcome. Widely known anecdotal accounts for important scientific discoveries or theoretical revolutions can be mentioned as examples of this kind of process (e.g., Kekulé's solving the structure of the benzene ring during a daydream, in which he saw a snake biting its tail, thus forming the ring; or Einstein's thought experiments, such as the one in which he imagined having an entire physics laboratory inside an elevator).

We also retrieve all the attributes related to perceptions and imaginations, through associative mechanisms, as it has been frequently conceptualized by dual process accounts of human social cognition (e.g., Fazio, 2001; Strack & Deutsch, 2004). Thus, from imaginal processes, an abstract representation of something may be achieved through associations. The iconic value of seeing conceptual or imaginal relations and processes by means of graphic representations or drawings, has been highlighted frequently as an example of this process. That is, we use the perceptual level to convey and clarify conceptual relations at the abstract level. Illustrations, therefore, have demonstrated a privileged place in the development of human cultures, either just to help imagining of situations described in a text, or for the more complex side of conveying abstraction by means of concrete conceptual examples.

7. Implications for educational and psychological research in the environmental domain

In this paper, we have presented a general psychological theoretical proposal, which might find applications in different applied areas of psychology: educational, environmental, and social. We discuss, in particular, its implications for the field of environmental education and environmental psychology (e.g., Bonnes & Carrus, 2004; Clayton, 2012). All the applications in this field of inquiry imply the valuation that human subjects make about the features of their milieu and daily life environments, in view of a more aware self-regulation of personal behaviour in the context of social interaction (e.g., Guéguen & Stefan, 2016).

Motivation and valuation processes in relation to the three different levels discussed here (i.e., perception, imagination and abstraction), indeed, are key factors to understand and explain self-regulation and behavioural control as the basis of positive outcomes and efficacy within the learning and the education process, considering the micro-system and the mesosystem of the education process, according to ecological theories of human development (e.g., Bronfenbrenner, 1979). These concepts might be relevant to understand more deeply current human behaviour in relation to climate change (e.g., Reser & Swim, 2011), which, in turn, is a key process for current environmental education and for the promotion of sustainability.

These aspects are important first of all the social interaction that occurs directly in the educational contexts, either indoors in the classroom, or outdoors in other educational spaces, such as playgrounds or school gardens (see for example Carrus *et al.*, 2015). In addition, the issue of more aware and «mindful» information processing regarding the value attributed to one's own perception, imagination, and abstractions is relevant to understand pupils' and students' cognitions and behaviours outside the education context. This might be particularly relevant for promoting the capacity of considering the future consequences of one's own actions, in relation to other human beings, to other species, and to ecosystems in general (e.g., Strathman *et al.*, 1994). The implications of cognitive and social conceptualizations about time and space also have been suggested by some authors in the field of environmental psychology, and this might have a strong relevance to environmental education practices (e.g., Corral-Verdugo, Fraijo-Sing, & Pinheiro, 2006).

Furthermore, we argue here that, in addition to the educational context, the present theoretical proposal advanced here is relevant to understand better the relation between the person and the environment. In fact, understanding the interaction between individual level perceptions and cognitions, the built environment and human-made ecological habitats, and the behavioural aspects of environmental sustainability and natural resource conservation, requires an understanding of human valuation processes. An example in this domain is crowding, an issue that has been found to affect quality of life and human relations in different kinds of environments. Crowding has to do with the negative valuation of perceived density in a given space; the perception of loss of control, and the great volume of information that enters the perceptual system of subjects is a relevant part of this valuation process. Based on the huge literature about crowding in environmental psychology, it would be interesting to carry out studies adopting the three-level valuation approach that we propose here. Landscape assessment and restorative environments also could be interesting arenas to apply valuation theory, as it has been shown how variables at different levels (e.g., individual, social or developmental) may interact in affecting the relation between the perceived restorativeness of a given environment and the subjective wellbeing of its users. This explains the capacity of different restorative experiences to improve the quality of human life in daily life settings (e.g., Carrus *et al.*, 2017).

Another area that might benefit from this approach is the study of climate change perceptions and evaluation. It has been suggested how a more accurate knowledge and interpretation of climate change phenomena, such as global warming, could be an important predictor of resource conservation behaviour (e.g., Doherty & Clayton, 2011; Gifford, 2011). Therefore, knowledge itself certainly might be an important variable to focus on, to understand and predict human sustainable behaviour. However, it also is important to take into account the value implications of knowledge, in addition to its propositional structure. In the case of the study of public opinion on climate change, we might distinguish between the facts that have been established from the value system that derives, by implication, from such facts. Recent studies, indeed, suggest that mindfulness, or cognitive reappraisal, which could be seen as two processes implied in a strict relation between the perceptual, imaginal, and abstract stage of internal mental state valuations, could be a predictor of climate perceptions; this, in turn, positively predicts individual ecological behaviour (e.g., Panno *et al.*, 2015; Panno *et al.*, 2017). Valuations at the perceptual and imaginal level also might be considered in this case, as they may have different implications for explaining drivers of, and barriers to, human action in relation to climate change. They also could allow for explaining the relations between climate change perceptions, human social cognition, and wellbeing (e.g., Panno *et al.*, 2017).

Finally, it is important to underline the potential of the present theoretical reflections in the applied educational field. By recognising the distinction among the three different stages of valuation in human perception and cognition, it could be possible to customize the educational tools and practices according to the targeted domain in the learning process involved in the education experience, as well as according to the distinct developmental challenges that the learners are facing in their specific lifespan trajectory. Also, it is arguable to envisage more ecologically valid and realistic forms of knowledge transmission and co-production, if the three stages consistently are taken into account in the teacher-student relationship, so that students and pupils can be involved in learning situations that allow for the expression and the development of pragmatic bottom-up competencies, not only top-down procedural knowledge abilities. Likewise, we want to underscore here that a more aware and mindful approach (e.g., Roeser *et al.*, 2012; see also Barth, 2001), in terms of the different levels involved in students' perceptions and processing of the external stimuli, could help education professionals to develop and maintain a positive social climate in the learning settings.

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Riassunto

In questo lavoro viene proposto un nuovo approccio al tema delle teorie sulla motivazione, sulla base di una prospettiva cognitivista, attraverso il concetto di valutazione. Motivazione e valutazione vengo passate in rassegna e discusse alla luce di una prospettiva ambientale, evolutiva ed evoluzionista. Nella proposta teorica qui avanzata si vuole sostenere come la motivazione possa essere considerata semplicemente come uno dei vari meccanismi che compongono i processi cognitivi, essendo legata al valore adattivo del rapporto tra persone e oggetti, situazioni e contesti. La motivazione e la valutazione vengono proposte come oggetti percepiti, immaginati e concettualizzati del processo di cognizione. Pertanto, la motivazione viene assunta come il prodotto di un complesso processo di computazione cognitiva, che determina il valore adattivo delle nostre cognizioni, e fornisce una risposta valutativa. Vengono infine discusse le dimensioni percettive, cognitive e simboliche del processo di valutazione, e vengono identificate le implicazioni della presente proposta teorica per lo sviluppo futuro della ricerca di base e applicata nel campo della psicologia ambientale e dell'educazione ambientale.

Parole chiave: Cognizione, Educazione ambientale, Motivazione, Percezione, Psicologia ambientale, Valutazione.

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