ENHANCING THE HUMAN POTENTIAL
Psychological Interventions in Different Settings

Abstracts of the chapters

1. Processing Visual Images to Solve Problems

In this chapter a series of studies aimed at providing evidence about the effects of mental visualisation on unproductive problem-solving procedures, as the tendency to apply misleading mathematical operations, are reported. Researchers explained how mental visualisation can facilitate the processing of the problem field and how the cognitive reorganisation can occur. Furthermore a crucial question is the identification of the best moment to use visualisation (before or after the presentation of the problem): data confirmed that the efficacy of imagery in problem solving depends on the phenomenological and objective features of the stimuli. The last part of the chapter concerns the awareness of the usefulness of mental visualisation. The investigation tried to identify on which bases individuals think that visual imagery can facilitate problem solving and to assess the relationships between ratings of the utility of visual images and some individual differences in imagery.
(*Sarah Noemi Bonomi, Chiara Spinelli*)

2. Mental Visualisation in Sport Training

Thw chapter is focused on mental practice, a training method without any muscular activation. It particular focuses on motor imagery that involves a motor task with a specific intent. In letterature mental practice is used for single sports but the chapter is aimed at shwomg how performance in team sports, specifically basket, can be improved. Motor imagery could help teaching tactical strategies, as the lay-up shot technique. This technique involves different parts of the body. In the reported experiment different judges evaluated different features of the movement: fluidity, rhythm, coordination, step accuracy, and balance landing. The experiment was conducted on two groups of female basket players: the experimental group used motor imagery whereas the control group didn't. Results showed that mental practice influenced significantly coordination and step accuracy, independently from the previous subject's imagery ability (evaluated with the Italian version of the VMIQ test).
(*Sara Bordo, Laetitia Carboni, Giulia Volpi*)

3. Mental Visualisation in Rehabilitation

This chapter talks about the neural bases of cognitive styles. More precisely, people could be verbalisers or visualisers. The first style is correlated with pattern of activity in the fusiform gyrus, whereas the second is correlated with the supramarginal gyrus. Three studies are reported. The first one concerns patients with brain lesions associated with cognitive impairments. Results underlined that cognitive styles are independent from abilities and that styles can change across life. Furthermore it is important to match patient's style and the kind of therapy. The second study focused on the correlations between cognitive style and site of lesion. It has proved that deficits in basic cognitive processes lead patients to prefer verbal styles, whereas visuo-spatial deficits reduce the tendency toward the visual style immediately after the brain damage, but later such style may become predominant. The third study stressed the importance of considering the timeline of the impairment and the personal cognitive style in order to assess the efficacy of rehabilitation.
(*Elena Cavalli, Domenico Delcuratolo, Alice Salducco*)

4. Music in Motor Learning

In this chapter authors explored the effects of manipulation of primary cortex (M1), where mirror neurons are allegedly located, through tDCS (transcranical direct current stimulation). Two different neuromodulation conditions were tested: a sham condition and an anodal condition, which increases the excitability of neural tissues. A further aim of the study was to explore the influence of music on psychophysiological responses (e.g., changes in skin temperature) measured by means of a biofeedback equipment. Music was synchronized to the scenes presented in a set of videos which were balanced for human vs. non-human actions and for type of movement presented (included basketball motor actions). The study involved a sample of college students attending Motor Science courses, with no professional expertise in basketball.
(*Cecilia Fiocchi, Laura Magni, Marta Michelucci*)

5. Music in Rehabilitation

Music has been used for therapeutic goals for a long time, but only in the last few years it has been employed through a scientific approach. It is possible to identify three broad categories of utilisation: (i) to induce a psycho-physiological state, a mood or an attitude; (ii) to stimulate the person to interact with other individuals; (iii) to activate behaviors and mental operations that need to be rehabilitated. Music is a multimodal tool which can be associate to the three cognitive modes identified by Bruner: i) motor (since music is strongly embedded in the body movements and generates motor responses in the listener that allow the person to mirror the gestures performed by the interpreter and to understand part of the meaning of music); ii) iconic (music can be easily converted into images); verbal (analogies between music and

language can be detected). Music can be used in post-stroke rehabilitation, when the patient tries to improve motor performance by mentally rehearsing a movement. This activity has been shown to cause changes in the brain. Virtual Reality can be used combined with music in the rehabilitation process, as exemplified in a study with two hemiplegic patients. The study proved that both individuals showed increased motor scores and an improvement in daily-living activities after treatment.
(*Chiara Grecchi, Marta Malaman*)

6. A Reflective Approach to Creativity
In this chapter a training programme to improve creative thinking, addressed to children aged between 4 and 10 yrs. and constituted of 20 episodes, is presented. The assumptions underlying the training are highlighted and data supporting the efficacy of the training are reported. People usually think that children do not have ideas or opinions about creative strategies, even though this is not true. It is important to lead persons to believe that creativity is a unique mental skill that can be learned. To foster creative thinking it is possible to reflect about an integrated structure of mental skills that are relevant in a particular situation or phase of the creative process. Traning programmes need to be based on real-life materials and should support students who try to follow new and unknown approches, as well as thier metacognitive sensibility should be enhanced.
(*Roberta Rizzo*)

7. Reflection in Emergency Medicine
Physicians have three ways of thinking available to make decisions, each with its own strengths and weaknesses. Firstly, the intuitive system can immediately suggest the relevant behavior. This system proceeds basically outside of awareness, in the sense that we do not have information on how things are going in our minds, but we are aware only of their final outcomes. Then physicians have heuristic strategies, offering simple procedures to simplify situations and find satisfactory answers. These are placed at an intermediate level of awareness. Their application sometimes happens automatically, but we can easily reconstruct the principles on which they are based. Furthermore, these strategies can be applied and taught intentionally. Finally there are thought processes based on logical criteria and normative principles. They allow physicians to reflect on the situation coldly and analytically, to weight pros and cons, to identify possible sources of error. The flexible use of the three systems seems to be the optimal situation, with the individual who activates the system more relevant for the given situation and eventually passes to another system when he sees the inadequacy of the previously fielded. But how can flexibly manage the interaction between the different systems? It seems to need metacognitive competence. Metacognitive competence includes several sub-skills: having adequate beliefs about the way the mind works; being aware of the way your own mind works; being able to control the operation of your own mind based on information you get from the knowledge of the way you think and based on the beliefs that you have about the general functioning of the mind. Relevant metacognitive competence should be developed when training medical staffs, so that operators know from time to time to identify the mode of thinking - intuitive, heuristic or analytical - which is best suited to make the choices required by the clinical cases that they have to face.

8. Self-regulation in Multimedia Learning
This chapter deals with multimedia learning, as conceived in according with Mayer's learner-centred approach, which is based on the idea that the role of technology is to adapt itself to the user's characteristics. The main principle is that students should learn better from words and pictures than from words alone. In this approach there is room for individual differences, such as cognitive styles (for instance Torrance's distinction between right and left thinking) and metacognitive competence (both explicit and implict). Two studies are reported which were carried out to investigate how users interatc with the multimedia enviroment and to assess if they are conscious of their own actions. The sample of both studies is composed by university students, which were assigned to one of two experimental conditions: audio condition (with text in audio format) and video condition (with text in on-screen format), both associated with images which could be displayed on demand. The first study was focused on cognitive styles and metacognitive awareness, the second one was about self-regulation and metacognitive knowledge. Results showed that students asked for more images (coherent with the text) when comprehension was more difficult and they remembered more notions in the audio condition, probably because it involves attentive process to a larger extend. Cognitive strategies play an important role in multimedial learning. The studies supported the notion that people can change their learning strategies depending on the features of the multimedia presentation.
(*Dora Caronia, Laura Colautti, Lucia Ognissanti*)

9. Virtual Reality in Technical Training
The paper is about how Virtual Reality (VR) can be integrated with hypermedia in educational contexts, in particular in order to improve learning the use of a mechanical device, namely, a lathe. The instructional system consists of three environments (VR, hypermedia, and tutor). Students can choose different kinds of learning activities depending on their needs: theoretical lessons, demonstration lessons, guided practicing, free practicing, and examination. Three types of training procedures were proposed both to naive and expert students: VR (learning proceeds from action to conceptualization), hypermedia (learning proceeds from conceptualization to action), and VR-Neutral (students navigated freely a virtual room with no connection with the lathe). Learning outcomes were evaluated with different

questionnaires. Results showed that VR helps both naive and expert students to build a mental model of the lathe, whereas hypermedia improved knowledge acquisition in a more sophisticated way.
(*Maura Crepaldi, Alessandra Del Forno, Laura Fasano*)

10. Multimedia Tools for ADHD Patients

Hypermedia tools show advantages in comparison to traditional educational instruments because they allow learners to simultaneously activate both the verbal and visual channels and permit an organisation of information similar to the human associative memory. Students with learning difficulties can benefit from these instruments too. In fact, hypermedia tools may increase attraction, curiosity, sense of control, and motivation. On these grounds it can be conjectured that these instruments should lead ADHD students to get better school results. Thanks to computer-assisted instruction their performance can become similar to the normal achievers'one when contents are presented through text and pictures simultaneously. In this way, hypermedia tools produce benefits in declarative, conditional, and procedural knowledge. The study reported in this chapter compared the effects of hypermedia and traditional instruction in students with ADHD, students with ADHD and learning problems, and typically developing learners. Results showed that learning is better in hypermedia than in traditional instruction both in the knowledge acquisition and retention phases. In conclusion, hypermedia education can enhance ADHD students' performance in learning tasks.
(*Francesca Chiara D'Ambrosio*)