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Neuro-Linguistic Programming & VR via the 8 Pillars of Metacognition X 8 Layers of Consciousness X 8 Intelligences

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Abstract. Neuro-linguistic programming (NLP) has already achieved great popularity as a method for personal development and excellence. It is already used by successful educators, managers, trainers, salespeople, market researchers, counselors, consultants, medics, top athletes and lawyers. However, there is a lack of understanding about the secrets behind the success of neuro-linguistic training in various areas of human life. What are the pillars of its success? What is the role of metacognition? The specific aim of the present review is to explore the relationship between neuro-linguistic programming and metacognition as well as their role in building human excellence. In addition, we investigate, for the first time to our knowledge, the effectiveness of NLP in virtual reality in order to promote metacognitive development in terms of behavior change, subconscious reshaping and consciousness-raising. The results of this review showed that there is a mutually reinforcing relationship between Neuro-linguistic programming and Metacognition. Research has also shown that virtual reality provides the ideal environment for the application of subconscious training techniques like those of NLP. We conclude with a new layered model of NLP based on the principles of metacognition. This model aims to condition people to become awake, transcend their limitations, and enter a higher state of consciousness.

Keywords. metacognition, neuro-linguistic programming, virtual reality, avatars, brain-rewiring, memory restructuring, subconscious reshaping, unlearning, relearning, consciousness, intelligence, higher mental abilities, metacognition, peak performance

1. Introduction

Neuro-linguistic programming (NLP) was officially established in the 1970s by Richard Bandler and John Grinder with the development of a new methodology aiming at modeling excellence (Tosey et al., 2005). NLP is considered a solution-based approach since it does not search for roots of problematic behaviors but seeks to motivate behavior change. NLP harnesses strengths, focuses on meanings, possibilities, and solutions, talks about feedback not 'failure', suggesting that if something doesn't work it is preferable to try something different. (Linder-Pelz & Hall, 2007).

Certain ideas of NLP date back to ancient Greece, Egypt and Babylon in traditions like Confucianism, stoicism and sophism in which various methods of self-reprogramming were systematically taught. For instance, sophists recognized the role of speech and body language in persuasion. Plato teachings focused on how experiences become imprinted deep within us. Aristotle studied the perfect logic that persuaded people (Seitova et al., 2016).

The substantial resource of NLP is considered the Human Potential Movement of which Abram Maslow and Carl Rogers were the leading pioneers. Koerzybski, Virginia Satir, Fritz Perls, Bandura, Erickson, Bateson numbers among the originators of NLP. According to their point of view, all individuals have the resources needed to manage their own cognitive maps and actualize their immersive potential (Linder-Pelz & Hall, 2007).

NLP shares a common ground with the social-cognitive theory (SLT) of learning, developed in 1985 by Bandura. SLT points out the importance of observation, imitation and behaviour modelling in learning and behaviour change (Nabavi, 2012). Positive psychology is also in line with NLP since it recognizes the influence of belief systems on human performance. It also highlights that people are hardwired to negativity sabotaging their success. Thus, NLP is in search of the strategies that boost people's joy, self-confidence, and resilience (Gable & Haidt, 2005).

Virtual reality (VR) is an interactive 3D “imaginal system” that replaces a real-world environment with a virtual one. VR prevails over other media because of the feeling of being present in the virtual environment. The present experience reduces the conflict and makes self a catalyst to change. It also alters the conceptual system of the users cultivating positive beliefs (i.e. self-efficacy). The use of VR helps users to develop new skills, to improve communication and imitation skills and learn to cope with challenging social situations. Thus, virtual reality has the potential to re-organize internal and external experiences facilitating behavioral change (Riva et al., 2016).

Metacognition refers to a set of consciousness-raising skills and strategies through which individuals direct their actions towards excellence. Metacognition involves individuals' ability to observe, regulate and adapt their own internal cognitive processes, recognize the difference between functional and dysfunctional states of mind and consciously choose those states that awaken the full range of their own abilities and identity (figure 1) (Drigas & Mitsea, 2020). Drigas and Mitsea (2021) described metacognition using a layered structure. Each layer represents a distinct state of mind where an ever-higher control system responds to the necessity of creating more abstract mental representations, upper-class motivations, beliefs and emotions (figure 1,2).

The 8 pillars of metacognition

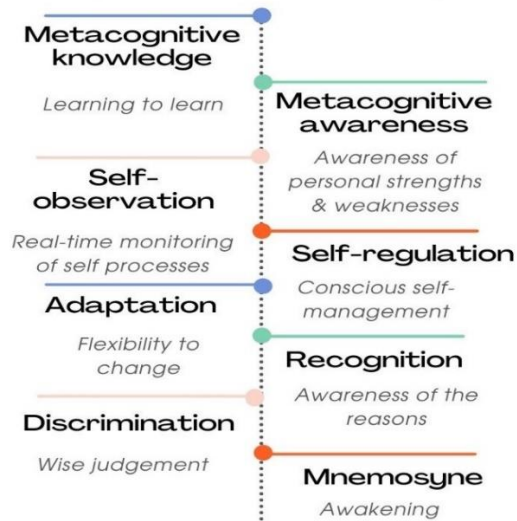


Figure 1: The 8 Pillars Model of Metacognition

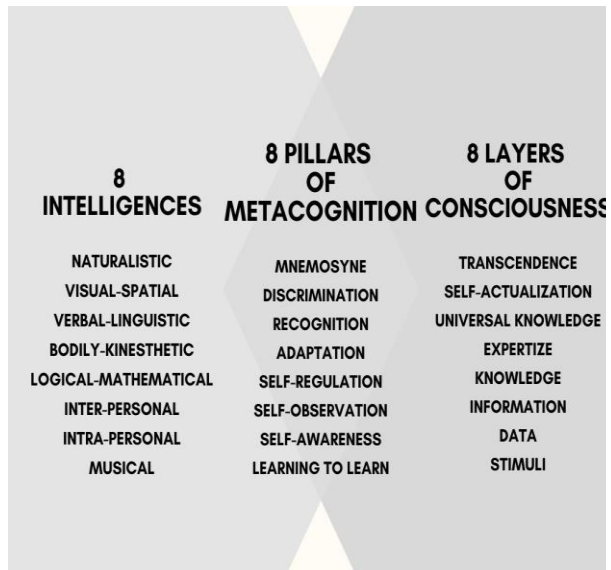


Figure 2: The 8 X 8 layered model of metacognition stands on 8 pillars of metacognition X 8 layers of consciousness and 8 intelligences

2. Method

The purpose of the study was to investigate the relationship between neurolinguistic programming and metacognition according to the models of metacognition developed by (Drigas & Mitsea, 2020; 2021). Furthermore, we explore the effectiveness of neuro-linguistic programming training in virtual environments. To the best of our knowledge, it is the first time that a study associates neuro-linguistic programming with virtual reality. The method used to write the article was the bibliographic review method. We found many reports and articles. The literature on neurolinguistic programming is broad. We search articles through search engines: Google Scholar and ResearchGate. We tried to find the latest research published in international journals. The keywords we use to search for articles were neurolinguistic programming, neurolinguistic psychotherapy, techniques, strategies, virtual reality, behavior change, avatars. One of the limitations of the research was the limited amount of the research studies as regards NLP. In addition, there is no research that explicitly correlates virtual reality with neurolinguistic programming.

3. Results

Neuro-linguistic Programming in the light of the “8 Pillars Model of Metacognition”

3.1 NLP & Metacognitive Knowledge

The first pillar provides a greater understanding of how NLP affects the way the human brain works, learns, and grows its own capabilities (Drigas & Mitsea, 2020).

Kotera et al. (2019) conducted a qualitative examination of the experiences of senior managers who had recently received NLP training. The training program focused on teaching the basic concepts and skills of NLP. Semi-structured interviews attended by NLP master practitioners were analyzed. All the senior managers reported that NLP improved their understanding of the human mind works. Specifically, they deepened their knowledge about cognition. Most important, NLP enhanced their desire for knowledge and understanding. They

realized that knowing skills are not enough. It is necessary to decode their underlying mechanisms. They also claimed that NLP helped them to analyze excellence, to examine why NLP methods work and how they could apply these techniques to different situations.

Perception: Neuro-linguistic programming improves human perception. According to Andreas et al. (2009), NLP training motivates individuals to perceive the world from different viewpoints, encouraging them to look at the world from at least three positions: through their own eyes, through another person's point of view and as an independent observer. Furthermore, it helps clients to clear their perceptions, to perceive what's going on and get in touch with their situation. NLP training aims at aligning clients' various perceptual positions to bring greater wholeness and become more integrated.

Subliminal cues can also alter perception in favor of peak performance (Blanchfield et al., 2014). Thirteen athletes observed subliminal words and faces on a digital screen for less than 0.02 seconds and were masked by other visual stimuli making them unidentifiable to the participants' conscious mind. Each time the athletes were presented with positive visual cues such as "go", "action", "lively" or happy faces, their endurance performance improved. The authors concluded that subconscious training modifies the non-conscious part of the perceptual system and as a result, it has a significant impact on human performance in the conscious state. They also propose the use of "smart glasses" to provide positive subliminal cues during training.

Higher mental abilities: Amirnudin et al. (2020) explored the feasibility of Disney's NLP-based strategy to improve students' (n=40) higher mental abilities like analysis, synthesis, assessment and creative problem-solving. Disney's strategy consists of three phases: creative, realistic and critical. Initially, the students were asked to think like a dreamer visualizing new ideas to answer mathematics questions without judging themselves. In the realistic phase, they were instructed to think about the implementation of their ideas. Finally, in the critic phase, the solutions obtained were reviewed and questioned by students. If an error occurred, students were required to rectify it, and if the answer was incorrect, they could restart the creative phase. The results showed that the NLP-based strategy empowered students' higher mental abilities.

Harris et al. (2017) explored the effect of self-affirmation on two aspects of performance that have been related to executive functioning: working memory and inhibition. Eighty-three participants were randomized to either a self-affirmation or a control task and then completed the computerized tasks. The results showed that self-affirmed participants performed better on both tasks. Thus, self-affirmation can improve aspects of performance related to metacognition and self-regulated behavior.

Hormones: NLP encourages individuals to set positive anchors by recalling positive memories. Early life stress exposure increases the risk for depression and sensitizes the maturing psychophysiological stress system to stress in later life. Askelund et al. (2019) found that training in recalling specific positive memories in 427 adolescents at risk of depression is associated with fewer negative self-cognitions and lower morning cortisol. Lower cortisol is associated with decreased amygdala activity and therefore also better emotion regulation.

Brain Connectivity: De Voogd et al. (2018) provided an account for how goal-directed eye movements, as used in EMDR, can enhance extinction learning (unlearning) through neural circuits that are responsible for the cognitive control of emotion. Specifically, they found that the NLP-based task deactivated the amygdala. In addition, it altered the connectivity between the amygdala and the dorsal frontoparietal network as well as connectivity between the amygdala and the ventromedial prefrontal cortex.

Epigenetic mechanisms: Epigenetic mechanisms play a role in the detrimental effects of post-traumatic stress disorder (PTSD). Vinkers et al. (2021) examined whether Eye Movement Desensitization and Reprocessing (EMDR), an NLP-based method, could restore

several epigenetic marks. EMDR is considered one of the most evidence-based treatments for PTSD which involves exposure, desensitization, cognitive restructuring and reprocessing. Forty-four male combat veterans with PTSD and twenty-three without participated in this study. The results showed that EMDR was accompanied by specific DNA methylation changes (which play a significant role in the functions of the hippocampus, a crucial area for memory functions in general and traumatic memories in particular).

*“Oh yes, the past can hurt. But, you can either run from it or, learn from it.” – Rafiki
(The Lion King)*

3.2 NLP & Metacognitive Awareness

The second pillar of metacognition seeks the ways individuals acquire awareness of their self-limitations and personal strengths, considering all the possible variables of their situation, overcoming black-white dichotomy, and “seeing” beyond the visible spectrum (Drigas & Mitsea, 2020).

Hollander et al. (2016) evaluated the behavior changes of 25 individuals with mild psychological or social problems after an NLP intervention. Initially, the participants were asked to score their chosen problem behavior on a 10-point rating scale at least 20 days prior and 20 days after the intervention. During NLP coaching, the participants were instructed to reformulate the chosen psychological problem into a goal for treatment. Specifically, they were encouraged to translate what they did not want into what they did want. The practitioner constantly was giving feedback about the ways they could formulate right, specific and attainable goals. In addition, they helped clients to visualize achieving their formulated goals as lively as possible from the first experiential position and concentrate on the associated feelings. The next step consisted of defining the obstacles that had kept them from reaching their goals in the past formulating advice to overcome these obstacles from the viewpoint of the present self. Finally, they were asked to determine the psychological resource they would need to overcome the obstacle toward achievement and relive a moment when they had experienced the chosen psychological state. The statistical analysis revealed that NLP resulted in a reduction of the perceived intensity of the psychological problem. Most importantly, the participants acquired a clearer perception of their situation while at the same time, they transformed their limitations into opportunities.

Levi et al. (2014) used subliminal messages to help older patients to improve their self-perception and they compared the results with the explicit intervention group. The results showed that the implicit intervention group was significantly more effective than the explicit one. Specifically, the participants had a more positive and realistic self-perception. The stereotypes that people tend to assimilate from their cultural environment were reduced. Most important, after the intervention, the participants in the implicit training group significantly improved their physical functions.

“Believe in yourself and there will come a day when others will have no choice but to believe with you.” – Mufasa

3.3 NLP & Self-Observation

Self-observation refers to the inner vision that enlightens the sources of behaviors (Drigas & Mitsea, 2020).

Gray et al. (2012) described a case study of a 30-year-old veteran who was treated with an NLP technique known as the rewind technique. During the intervention program, the client was guided to imagine that he was seated in a movie theater observing himself on the TV screen. Afterward, he was asked to dissociate from that image visualizing himself floating out of his

body, in other words, to observe the observer. After the third treatment, all symptoms disappeared. At 30 days post-treatment, the symptom scores were still zero.

Karunaratne (2010) reviewed the evidence about NLP's effectiveness on phobia treatment. This study revealed that NLP techniques are successful in phobias treatment. Karunaratne argued that NLP strategies regulate strong emotions through the emergence of a rational observer. NLP techniques may facilitate direct processing, allowing sensory information to travel via the thalamus and cortex, where further integration and processing takes place before accessing the amygdala, the center of fear, namely the amygdala.

Athletes of the highest level acknowledge that visualization techniques play an important role in achieving the optimal state of mind, which in turn permits them to design their mental road maps for success. Visualization techniques require advanced observational skills. In the majority of cases, the athletes apply positive visualization either from a first- or third-person perspective. In other words, they observe themselves inside their own body or outside their body. In addition to changing perspective, the effectiveness of this technique is also based on individuals' ability to engage the senses with the aim to make the mental images as vivid as possible. It also requires individuals heightened awareness and conscious control of the details of the actions, body's position, emotions, movements, speed, time and space (Predoiu et al., 2020; Slimani et al., 2016).

When people recall past memories, they adopt a particular visual perspective either watching the past from their own eyes or as observers. According to Jacques (2019), visual perspective plays a significant role in reshaping one's own memories. The visual perspective one adopts alters the vividness as well as the potency of the memory and has an important impact on recollection capacity. It is also mentioned that the first-person perspective is associated with stronger recollection.

"Look inside yourself. You are more than what you have become." – Mufasa

3.4 NLP & Self-Regulation

Self-regulation seeks to resolve the conflicts that disrupt the upgrowth road towards self-development (Drigas & Mitsea, 2020).

Ahmad et al. (2011) used hypnosis, NLP and Timeline Therapy as a means of reducing the intensity of negative emotions attached to memories of stressful events. The research involved 32 test subjects and 32 control group participants. The researcher utilized the NLP dissociative technique. The participants were asked to recall vividly a stressful event from the first- person view and indicate the level of intensity of their negative emotions. Then, they were asked to see through the third person view altering the 'submodalities' of the mental picture. Specifically, they were asked to change the color of the mental image to black and white, reducing its clarity, pushing the picture further and further away. The patients confirmed that NLP helped them to regulate the intensity of their negative emotions.

Language is powerful for the reason that it has a strong link with our subconscious mind. According to NLP the words we choose, shape our reality. They reflect our subconscious thoughts either negative or positive and direct our actions. Masuda et al. (2010) examined whether the use of rapid word repeating techniques could help individuals to cope with discomfort and reduce the believability of negative self-referential thoughts. By this NLP-based technique, a word is quickly repeated aloud until the context required for the word to have literal meaning changes. Specifically, the researchers compared the effects of the rapid word repetition technique with though distraction and a thought control task. 132 undergraduate students were randomly assigned to one of the three conditions. In the word-repetition task, the students were asked to reduce their self-relevant thought in a single word and repeat that word as fast as

possible. The results showed that word repetition reduced the emotional discomfort and believability of negative self-referential thoughts, significantly greater than comparison conditions. In addition, it was very effective with participants with elevated depressive symptoms. The participants reported that the meaning of the negative word began to disappear until it became just a sound. Thus, the authors concluded, that the word repetition technique is an effective self-regulation strategy especially in cases where control-based strategies (i.e. avoidance, suppression) may be ineffective.

Rhue et al. (1991) evaluated the effectiveness of a therapy program for sexually abused children using hypnotherapeutic techniques which center on storytelling. Storytelling provides the therapist with the opportunity to utilize suggestions, symbolism, images and metaphors to achieve emotional distance from trauma memories. The therapist described the case of a 9-year-old boy who was afraid of testifying in criminal proceedings court about the sexual abuse perpetrated by his uncle. The therapist told the child a story of a superhero who was always protected by an invisible clear plastic shield. Afterward, the child was instructed to imagine putting the shield all around him and pretend he was watching a television set showing the courtroom on the screen. This technique reduced the child's feeling of helplessness, modulated negative emotions and fostered the perception of self-control.

Siegel et al. (2017) examined whether the repeated presentation of feared images without conscious awareness via backward masking reduces avoidance in spider-phobic participants. Twenty-one spider-phobic and 21 control participants view stimuli in each of three conditions: (1) very brief exposure without awareness, (2) clearly visible exposure, and (3) masked images of flowers. The results showed that very brief exposure to phobic images without conscious awareness was the most effective method, especially for phobic participants. It was also found that only the non-conscious exposure activated brain regions that support fear processing and emotional regulation without causing them to experience the fear consciously.

In a single case study, Gordon et al. (2003) examined whether self-hypnosis combined with NLP would help a ballet dancer to cope with physical and mental burnout symptoms. The patient used the reframing technique during self-hypnosis to direct his feelings of being blocked and imprisoned using the following affirmation "I am free, strong and light". Then he was asked to find his own interpretation of this affirmation using body movements allowing strong visual-emotional associations. Afterward, in a state of deep tranquillity, he was taught to anchor peace by pressing his left earlobe twice. The aim of the latter was through conditioned association to reactivate this state of tranquillity during high-stress situations. The results showed that the dancer could more effectively cope with stress, pain and exhaustion. He also reported that he experienced a new sense of freedom, focus and energy.

"Everything you see exists together in a delicate balance" -Mufasa

3.5 NLP & Adaptation

Adaptation allows individuals to finetune their internal and external perceptions with their actions (Drigas & Mitsea, 2020).

HemmatiMaslakpak et al. (2016) examined whether NLP training could help sixty nurses to develop adaptive skills. The researchers applied various strategies such as goal setting, time-management, belief changing, reframing and Disney strategy. After NLP intervention, participants were more able to change unhelpful beliefs as well as modify adverse or stressful behaviors. They improved their interpersonal skills strengthening social interaction and effective communication. They also strengthened their intrapersonal skills. They changed their frame of mind, controlling the words used in everyday life, being capable of adapting themselves in different situations.

Çinar et al. (2021) examined the effectiveness of NLP on the conflict and interpersonal problem-solving skills of nurse managers. Forty-one participants were divided into two groups, the experimental and the control group. The Interpersonal Problem-Solving and Conflict Inventory were applied to collect quantitative data for the study. Semi-structured questionnaires were also utilized to collect qualitative data in focus-group interviews held both before and six months after the training. The participants in the training group were found to be more flexible, more positive and motivated in comparison with the control group. It was also revealed that they were more able to resolve conflicts, change perspective, empathize, minimize problems and actively listen.

People often tend to take only one position. NLP aims at helping individuals to think more holistically. Kotera et al. (2017), examined the effects of using NLP in career guidance in six students. The participants were asked to create and examine a plan from three different positions: the dreamer, realist and spoiler. The results of the quantitative analysis indicated a significant increase in self-esteem and self-efficacy. The participants developed a future vision. They were more able to make a clear plan and achieve their dreams. The participants also reported that NLP training helped them to feel hope, excitement, curiosity, courage and commitment.

Bacha-Trams et al. (2020) investigated how changing perspective is reflected on brain activity and eye movement. Thirty women were shown a 25-min clip from a movie about a moral conflict (Anna refuses to donate an organ to her sister who has cancer). The researchers asked participants to watch the film from either the perspective of the donor sister or the sick sister. The women's brain processing was measured by functional MRI and at the same time, eye tracking was carried out. The results showed that when the subjects watched the film from the perspective of the organ donor, this activated the brain areas of conflict management, decision making and moral processing. When the viewers watched the film from the perspective of the sick sister, this activated the brain areas where empathy, sympathy and compassion occur. These results showed that perspective taking assures flexibility and boosts participants' emotional intelligence.

People are hardwired to resist change, even if they are positive ones. Epton et al. (2008) examined whether self-affirmations could encourage people to make a healthy behavior change by consuming more fruits and vegetables. Ninety-three participants were randomly allocated to a self-affirmation or control group prior to reading a message regarding the health-promoting effects of fruits and vegetables. Participants in the self-affirmation group were asked to recall and give examples of past acts of kindness. Response-efficacy, self-efficacy, and intention were measured immediately after exposure to the message, followed by a 7-day diary record. The results showed that self-affirmed participants made a sustained behavior change by eating significantly more portions of fruits and vegetables. Self-affirming cultivated positive expectancies, promoted heightened perception of self, open-mindedness and wholehearted acceptance of the benefits of a new behavior habit.

People tend to smile when they are happy and frown when they are sad because mind and body mutually influence each other. Huang et al. (2010) conducted four experiments to test whether mind-body dissonance could motivate individuals to expand their cognitive categories and embrace atypical exemplars. In three studies, they paired happy and sad memories or happy and sad music with happy and sad facial expressions. In another experiment, we paired high-power and low-power roles with high-power and low-power postures. It was found that smiling while recalling a sad memory or assuming an expansive posture while being in a low power role expands the horizons of human perception and makes people more adaptable to unfamiliar ideas.

Legal et al. (2014) investigated the effect of subliminally goal priming on the processing of a persuasive message. Before reading the message, the participants were subliminally primed (or not) with the goal 'to trust'. Afterward, they were asked to complete a questionnaire about their perception of the message. The results indicated that subliminal goal priming led participants to a better evaluation and acceptance of the message. They also expressed more behavioral intentions in line with the message.

"Change is good." – Rafiki

3.6 NLP & Recognition

Recognition permits people to recognize what the self-imposed limitations does not allow them to recognize, to "see" the reasons of the behaviors (Drigas & Mitsea, 2020).

Sahi et al. (2013) examined whether the use of NLP in an antismoking campaign could change secondary school students' experiences and conceptions about smoking. The data consisted of the essays and interviews of the students (n=61, 12 to 15 years old). After a three-day NLP intervention program, the students reported that NLP helped them to better recognize the risks and dangers of smoking and drug abuse. The students started to do self-reflection that prerequisites the ability to recognize and interpret their own inner processes, taking into consideration their own aspirations and motives. The students also reported that although sometimes smoking seemed appealing, they felt that their subconscious mind reminded them that they did not really want to be a smoker.

Stipancic et al. (2010) evaluated the effectiveness of neuro-linguistic psychotherapy on depression, psychological difficulties and perceived quality of life. A total of 106 participants were randomly assigned to either therapy or control group. The outcome was assessed by the structured clinical interview for DSM-IV Personality Disorders and a scale that measured the quality of life. The results revealed that NLP helped participants not only to cope with their psychological difficulties but also to have a clear perception of their quality of life. They were more able to recognize the internal conflicts, the dysfunctional ways of thinking. Five months later, the participants maintained positive and satisfied. NLP gave patients reference experiences and tools to voluntarily activate unconscious processes that promote personal growth.

"Look beyond what you see." – Rafiki

3.7 NLP & Discrimination

Discrimination concerns the metacognitive ability to discern between good and bad ways of living and willfully choose the desire for Good (Drigas & Mitsea, 2020).

Taillandier et al. (2012) examined whether self-affirmation would affect the math performance of 95 women students in a setting where they were likely to experience stereotype threat. In the self-affirmation condition, the participants chose from a list the most important characteristics of them and then they carried out a dosage of calculation. The results showed that women performed better and more quickly in math tasks under the self-affirmation condition especially when participants were under stereotype threat concerning their supposedly poor math ability. The identification of their strengths and values helped them to direct their attention to the positive powers of their real self rather than to the social identity threats.

"Truth? But the truth is in the eye of the beholder." – Scar

3.8 NLP & Mnemosyne

Mnemosyne represents the internalized knowledge that purifies, awakens, and drives human towards the road of Anelixis (upgrowth) (Drigas & Mitsea, 2020).

Some memories become inaccessible. Other memories resist change because they are reinforced by the same data overtime. However, they may have a detrimental impact on human behavior. An increasing body of research highlights the role of NLP-based techniques on memory reactivation and restructuring (relearning) through the mechanisms of reconsolidation. NLP interventions using techniques such as visual-kinesthetic dissociation or rewind technique have been shown that help patients with post-traumatic stress disorder to rapidly take control over their intrusive memories. By this methods, past memories are rewritten freeing patient from the negative emotional baggage. Playing tricks to amygdala, NLP methods helps patients to reprocess traumatic past memories and come in peace with themselves (Gray & Liotta, 2012; Gray et al., 2019; Wright et al, 2021; LeDoux,2000) .

Cetin et al. (2021) evaluated the effectiveness of NLP practices on organizational citizenship behavior. Organizational citizenship behavior refers to a set of voluntary positive behaviors or actions that employees adopt with the aim to support an organization's goals without being part of their formal job description. This type of behavior requires altruism, conscientiousness, courtesy and virtue. A total sample of 180 nurses was trained through various NLP techniques such as metaprograms, metaphors, belief change techniques. The data were collected through face-to-face interviews. The results showed a significant difference in the total score of the organizational citizenship behavior in the NLP training group compared to the standard training group and the control group. Thus, NLP training reminded individuals that power derives from taking responsibility and happiness from striving for the common good.

Duncan et al. (1990) measured the changes in personal growth experienced by 54 participants during a 21-day NLP training program. The Personal Orientation Inventory was the measure of self-actualization at pretest and posttest. The results showed that NLP training contributed to significant changes on almost all scales. NLP training helped participants to be more present-oriented, inner-directed, self-aware and self-motivated, that is self-actualized.

Albalawi (2014) explored the effectiveness of NLP on enhancing the quality of life among 60 university students. The experimental group (n=30) participated in a 10-session NLP program. The researchers utilized the World Health Organization Quality of Life Instrument (QOL) to measure the impact of the NLP intervention. The statistical analysis revealed that NLP coaching had a significant effect on the experimental group as compared to the control group. Specifically, NLP enhanced students' awareness about themselves as well as the awareness about the importance of good life, personal growth and true being. They were more mentally alert, with a clearer perception of their life, their real needs and expectations. The feeling of overall life satisfaction increased. They were at peace with themselves having better choices in life. The results of testing one month later showed a further improvement supporting the idea that NLP provides people the tools to further build on, use and activate those processes either conscious or subconscious that awaken people driving them towards self-fulfillment.

"Remember who you really are, the one true king" - Mufasa's ghost

4. Neuro-linguistic programming & Virtual Reality in the light of Metacognition

Banakou et al. (2018) examined whether embodiment in a virtual body, strongly associated with high-performing cognitive abilities, would improve subjects' cognitive performance. Specifically, they investigated whether people virtually represented as Einstein would show greater executing functioning (fluid intelligence & working memory). Fifteen participants were embodied in a virtual body of Einstein and fifteen in a virtual body of someone

at a similar age as their own. It was revealed that the participants embodied in Einstein performed better on a cognitive task than the normal body with the improvement greater for those with low self-esteem. In addition, the embodiment of young participants in the older Einstein body led to a reduction of implicit bias and negative stereotyping against the elderly.

Osimo et al. (2015) investigated whether the embodiment in a virtual body of a famous counselor could improve mood and personal problem-solving. Participants were embodied in scanned copies of themselves in immersive virtual reality (VR) and described a personal problem to a virtual representation of Dr. Sigmund Freud. Then, they were embodied in Freud's virtual body, and from that perspective could see and hear their virtual doppelganger describe the problem. The results revealed that participants embodied in Freud's body solved more effectively their personal problems and improved their mood. While in the Freud body, they could give advice taking a counselor's perspective. Afterward, they were transferred back to their own virtual body in order to see and hear Freud's response delivered in a disguised voice. The authors concluded that embodiment gave participants the opportunity of detachment, changing perspective away from habitual ways of thinking about personal problems. In addition, it helped participants to develop a more productive dialogue with themselves, to be their own therapists. It was also demonstrated the power of virtual body ownership to effect behavior changes.

Rosenberg et al. (2013) examined how immersive virtual reality through an avatar with superhero abilities would increase prosocial behavior. A sample of 30 females and 30 males were assigned to receive either the virtual superpower of flight (like superman) or to fly as a passenger in a helicopter. Afterward, participants were also assigned either to a helping condition to find a lost diabetic child in need of life-saving insulin or a touring condition to navigate and explore a virtual city. After completing the virtual tasks, the experimenter "accidentally" knocked over a cup of pens and waited before attempting to pick up the pens, giving the participant time to help. The results revealed that the flying participants were quicker to help than helicopter participants. Thus, the virtual power of flight facilitated subsequent helping behavior in the real world. The participants in the flying condition had also significantly higher scores on the measure of presence, indicating that the more the participants were immersed in the experience, the greater their intention to help. The authors concluded that the embodiment of superpowers implicitly shifted participants' self-concept in a powerful way as "someone who helps".

Depression and negative mood are characterized by negative imagery, negative expectations about the future, a diminished ability to access and recall positive memories and verbal processing bias. Habak et al. (2021) explored the impact of a mental imagery-based processing model utilizing virtual reality on mood, state of well-being and future thinking. Seventy-nine participants took part in a 10-minutes mixed reality experience yielding positive imagery. They were shown a series of spectacular landscapes accompanied by environmental effects (i.e. warm breeze, with the aim to provoke interpersonal warmth), intensifying the sensory experience. Through virtual exploration aimed also at provoking a sense of hopeful anticipation, to help users to realize that openness and curiosity lead to a positively reinforcing experience. The results indicated that almost all participants felt less hopeless. The negative mood decreased whilst the sense of presence, positive mood and positive future thinking significantly improved.

Success depends on the degree of connections between our present and future self, in other words, self-continuity. Ganschow et al. (2021) investigated whether a novel perspective-taking exercise in virtual reality could increase future self-continuity. The exercise is based on the two-chair technique according in which the client sits opposite a vacant chair and he/she

visualizes the significant other. Then, the client asks the imaginary person a question and moves to the empty chair to answer the question role-playing as the significant other. The researchers adapted this technique to help participants to engage as their successful future self emotionally and cognitively. Specifically, they took the perspective of their successful future self in ten years. The participants from the perspective of their future self answered a sequence of questions designed to help them imagine what it would feel to be and reflect on how to become their successful future self. The exercise was conducted either in a virtual environment or in vivo. Results showed that the perspective-taking exercise in a virtual environment substantially increased all the future self-continuity domains (connectedness, similarity, vividness and liking). The authors claimed that VR took advantage because it enhanced imagination, focus, the sense of presence and self-vividness. At the same time, it reduced distraction and freed up the participants' cognitive resources. They concluded that VR could enhance the effectiveness of those techniques that require strong imagination.

Aymerich-Franch et al. (2014) investigated whether visualization techniques combined with the use of doppelgangers -virtual humans that highly resemble the real self but behave independently- could reduce public speaking anxiety and compared the results with a traditional form of visualization through imagination. Forty-one participants were divided into the experimental and control group. In the doppelganger condition, participants watched a doppelganger whose face was modeled from their face, performing a successful speech. Then the participants were asked to give a speech in front of some researchers of the lab. It was found that the participants (mostly the males) indicated lower anxiety, physiological sensations and higher self-perceived communicative competence in the virtual environment with the aid of the doppelgangers.

Veldmeijer et al. (2021) developed a virtual reality reminiscence artefact with the aim to help twenty-one older participants recollect meaningful memories reframing the subjective experience of loneliness. The virtual environment was a living room from the 1950s and 1960s wherein personal triggers were placed (i.e. subjects photographs, paintings, their favorite music). After using the VR prototype, life review reminiscence was applied by the researcher by talking about the collected memories with the participants. Preliminary test results showed that VR reminiscence promoted the well-being of lonely adults. The participants were more open to talking about their memories as well as their related emotions. They recognized that loneliness was a much bigger problem for them than merely the lack of social life. Many participants started their previous hobbies again. Most important, it stimulated the belief in their personal effectiveness. Finally, they reported that VR helped them to reflect on interpretations of memories and manifest repressed or hidden needs.

5. Conclusion

This review study revealed that Neuro-linguistic programming has the significant potential to rapidly and effectively help people to develop their metacognitive skills according to the 8 pillars model of metacognition (Drigas et Mitsea, 2020). According to the research conducted, NLP supports the 8 Pillars of Metacognition in the following ways:

1. **Metacognitive Knowledge:** NLP training deepens individuals' knowledge and understanding of human cognition. It enhances the desire to learn, analyze excellence and discover the underlying mechanisms beyond optimal performance. It was also found that NLP has a very positive impact in many areas of human cognition. Specifically, NLP:

- Boosts learning, unlearning and relearning.
- Expands human's perception.
- Contributes to memory restructuring.

- Empowers executive functions (working memory and inhibition).
- Improves higher mental abilities (problem-solving, creativity, analysis, synthesis).
- Lowers the hormones of stress (i.e cortisol).
- Decreases the amygdala activity.
- Alters the connectivity between the neural networks responsible for the cognitive control of emotion.
- Restores the epigenetic marks that influence the memory functions in the hippocampus.

2. **Metacognitive awareness:** NLP helps subjects to develop a more positive and realistic self-perception. It was found that NLP helped participants to transform their limitations into opportunities encouraging them to reformulate their weaknesses into new goals, to define the personal barriers that keep them from reaching their goals, to give themselves good advice from the viewpoint of the present self.

3. **Self-observation:** The research revealed that NLP can enhance the metacognitive ability of self-observation. NLP training helps the trainees to observe themselves from different perspectives making positive and vivid mental images. Through these techniques, it was found that people improved their ability to observe the observer.

4. **Self-regulation:** NLP strategies support subjects to self-regulate reducing the intensity of their negative emotions, the discomfort as well as the believability of the negative self-referential thoughts. Techniques such as changing the emotional and imaginative associations surrounding the words, non-conscious exposure or taking emotional distance from painful memories improved subjects' perception of self-control. It was also revealed that NLP had a positive impact on physical or mental burnout symptoms reduction.

5. **Adaptation:** Various research studies revealed the effectiveness of NLP on developing adaptive skills. Specifically, it was found that NLP:

- Makes people more positive to change unhelpful beliefs and modify stressful behaviors
- Strengthens interpersonal skills and supports social interaction. It motivates people to resolve conflicts, actively listen, change perspective and empathize.
- Develops future vision
- Cultivates hope, excitement, courage, self-esteem and self-efficacy

6. **Recognition:** NLP helped subjects to obtain a clear perception of their mental states recognizing the new opportunities, the internal conflicts as well as the dysfunctional ways of thinking.

7. **Discrimination:** Training on NLP helped people to restore filtering of reality better, take better decisions directing attention to the positive powers of self-development rather than to the unhelpful learned behaviors.

8. **Mnemosyne:** The research revealed that NLP makes people mentally alert and present-directed reminding them of the importance of living a good life, being at peace and seeking the true being. It also gave them access to new possibilities. Trainees learned that true happiness derives also from taking responsibilities and striving for a common good.

Although there is no research that explicitly correlates virtual reality with neurolinguistic programming, research has shown that virtual reality provides an ideal environment for the application of subconscious training techniques like those of NLP. It was found that NLP techniques such as those of modeling, perspective-taking, reframing, detachment, embodiment, self-dialogue, visualization, role-playing work extremely well in a virtual environment. This is partly because virtual reality provides a safe and controllable environment, enhances one's image vividness as well as the sense of presence, reduces distraction freeing up attentional resources. The use of avatars or doppelgangers had a pivotal

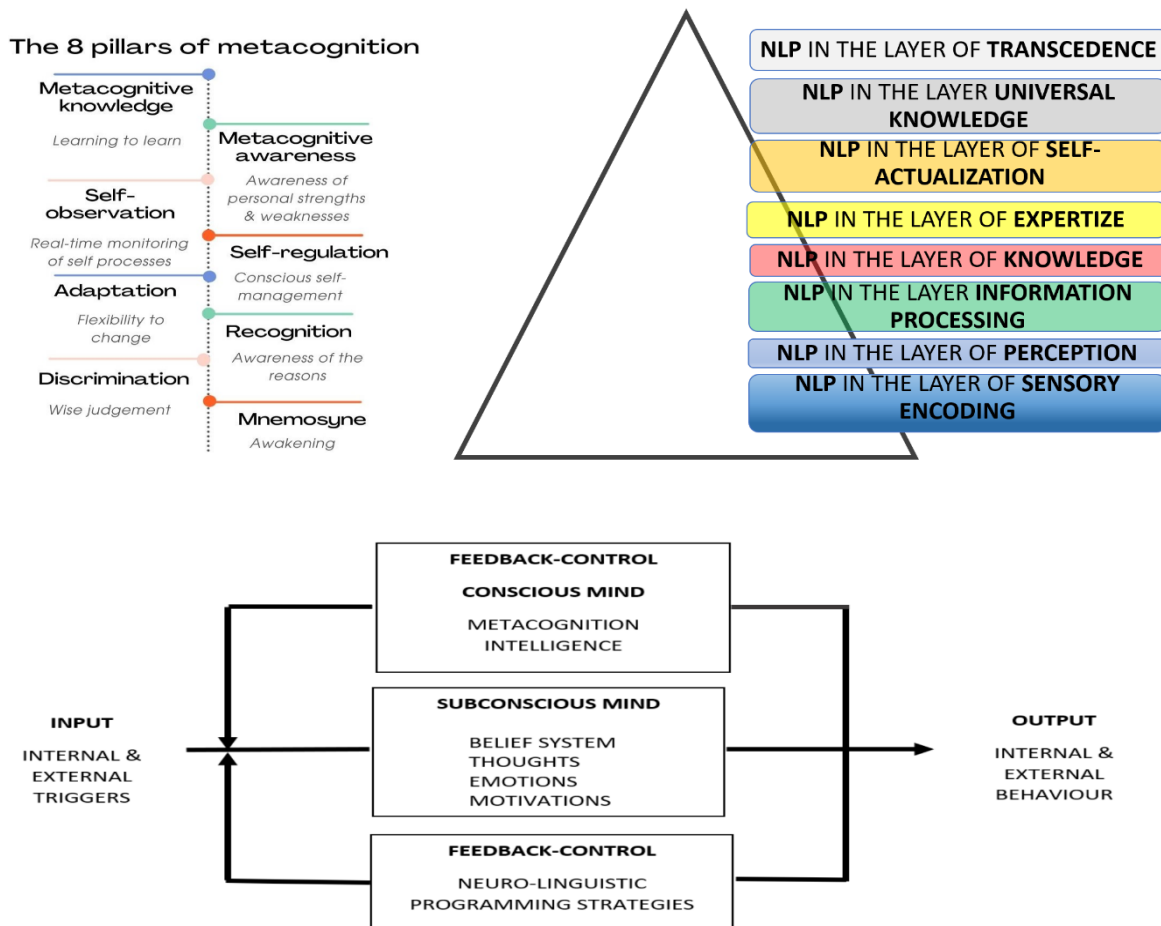
role in subconscious restructuring. Specifically, it was found that NLP-based techniques in virtual environments helped participants:

- Change and adopt more positive behaviors not only in virtual but also in real life.
- Reflect on their beliefs.
- Believe in their future and successful self.
- Recognize hidden abilities and powers.
- Overcome self-imposed limitations and effectively solve personal problems.
- Expand self-perception.
- Make successful choices.
- Develop self-continuity.
- Improve intelligence.
- Enhance self-esteem, hope and curiosity.
- Reduce implicit bias and negative stereotyping.
- Develop helping behaviors.
- Enhance emotional regulation (less anxiety, fewer depression symptoms, improved mood).

It is important to stress that there is a mutually reinforcing relationship between Neuro-linguistic programming and Metacognition. Neuro-linguistic programming utilises a number of techniques to reorganize the part of cognition which operates in a non-conscious level, but nevertheless, plays a pivotal role in conscious thinking and acting. For instance, looking at the researches as a whole, we observed that NLP facilitates memory restructuring (access to the non conscious part of memories) while at the same time improves working memory capacity and inhibition (the conscious part of cognition). Thus, we hypothesize that subconscious restructuring liberates working memory from the hidden ‘programs’ that run in the background burning off the attentional resources required for being conscious and self-controlled.

According Drigas et al. (Drigas & Mitsea, 2020; Drigas & Mitsea 2021;) consciousness is a matter of metacognition. The training models of Metacognition proposed by Drigas and Mitsea (2020, 2020b, 2021) encloses the fundamentals elements of neurolinguistic programming with the intention to ensure psycho-physiological homeostasis (Drigas & Mitsea, 2021a), intelligence improvement as well as consciousness raising (Drigas and Mitsea, 2021b). They are also in accordance with the layered model of emotional intelligence (Drigas & Papoutsi, 2018) and the model of ‘Consciousness, Intelligence and Knowledge’ developed by Drigas and Pappas (2017).

Thus, we conclude with a new proposal: **the new NLP layered model based on the principles of the ‘8 Pillars Model of Metacognition’ as well as the ‘8X8 Layered Model of Metacognition’** (Drigas & Mitsea, 2020; 2021) (figure 3-5).



Figures 3-5: The layered model of NLP is based on the principles of the 8X8 layered model of metacognition. It aims to condition people to become awake, transcend their limitations and enter a higher state of consciousness. The central mechanism of self-transformation depends on the two major control-regulation systems represented via system's control theory-modelling.

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