Mental footnotes: knowledge constructivism from logical thinking to personal beliefs and therapy

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ABSTRACT

The cognitive system has to carry out tasks that require mental activity, which is tiresome. Therefore, daily life demands that the system saves energy in order to be able to solve relevant problems. If we had to reason every single problem that was presented to us, our mental load and fatigue would increase immeasurably. Our minds can avoid the unnecessary waste of resources by taking a shortcut when reasoning. The output of previous reasoning turns into pieces of implicit information that constitute the meanings we give to things or circumstances, as the general framework where other reasoning occurs. These implicit meanings determine the manner we represent our environment and, therefore, our beliefs, emotions and behaviors. These mental footnotes set the manner in which we contemplate and conceive the world and we deal with reality. The better we understand these processes, the better we can control and restructure them, and even capitalize on their functioning for therapy.

Key words: Mental footnotes; Reasoning; Psychology of thinking; Psychopathological syndrome; Cognitive therapy.

Introduction

Thinking can be defined as a large number of specialized mechanisms – or modules – that process information and give solutions in a particular domain (Brase, 2014). Therefore thinking includes: i) recalling information (e.g., Baddeley & Hitch, 1974); ii) representing it (e.g., Johnson-Laird, 1983); iii) reaching goals by solving problems (e.g., Mayer, 1992); iv) learning new concepts (e.g., Rath et al., 2003); and, finally, v) making a decision (e.g., Kenrick et al., 2009).

Specifically for the module of reasoning, individuals use mental models of possible alternatives of specific situations to process information (e.g., Johnson-Laird, 2006). Mental models are based on the representation of the common features for a variety of entities related to a determined situation (Barwise, 1993). When dealing with propositions, humans envisage what is possible regarding the meanings that are being given. This semantic representation of information is as iconic as possible (Johnson-Laird, 1983). The products of this process of construction of mental models are images whose structure is analogous to the structure of the situation that they represent.

In the creation of mental models, a conclusion is true if it holds in every possible mental model that has been created from the understanding of an expression. On the other hand, the same expression would be catalogued as false if individuals can find, at least, one incompatible counterexample to any other generated model. In this sense, the semantic information of an expression is defined as the number of possible situations that the expression rules out. Therefore, the greater the number of incompatible situations generated by the expression, the more semantic information that expression provides (e.g., Castro, Moreno-Rios, Tornay, & Vargas, 2008).

The conceptual truth is an essential principle in the mental model theory (e.g., Johnson-Laird & Savary, 1999). The truth depends on the individual’s capacity to generate a mental model that represents instances of the given expression, or its negation. In this sense, individuals do not represent what is impossible to happen. This functioning mode minimizes the load on working memory by providing parsimonious representations. In order to understand how humans positively represent reality by en...
visaging what is possible instead of what is impossible, formal-logic-reasoning tasks have been used. In a series of experiments, even new assumptions were generated from given situations and were considered as true just because it was possible to envisage them (Goodwin & Johnson-Laird, 2010), although those conclusions were not logically valid. In the conditional:

\[ ¬ \text{red} \neg \text{square} \quad \text{(if no red, no square)} \]
\[ \text{red} \neg \text{square} \quad \text{(if red, no square)} \]

From a formal point of view, participants failed to recognize that the concept red and square conceptually at the same time is illusory. In the first clause, it is stated that if something is no-red, it will be no-square. On the other hand, the second clause states that if something is red, it will be no-square. Individuals make the mistake of validating the illusory conclusion of something red and square at the same time just because it is possible to represent the truth of both clauses at the same time. The error comes from the fact that participants do not envisage the exclusive formal disjunction stated in the first clause. To reverse the effect, incompatible concepts such as circular and square were used to make participants unable to generate the illusory conclusion from the impossibility of envisaging something concurrently being circular and square.

**Constructivism of knowledge**

Humans construct their knowledge, inter alia, from their rationalization of the experience with their surrounding environment. Therefore, individuals use mental models for both dealing with and formatting concepts (e.g., Neisser & Weene, 1962). In this sense, the fewer instances were used to make participants unable to generate the illusory conclusion from the impossibility of envisaging something truly being circular and square.

As the simplest example of the functioning of the implicit information, in order to represent negations, individuals do not create mental models for false clauses; they represent what is true and generate mental footnotes (in terms of Johnson-Laird & Byrne, 1991) to capture that the information being represented is false. In this sense, Bucciarelli and Johnson-Laird (2005) instructed participants to list the state of affairs of premises related to deontic action, such as *Workers are obligated/forbidden to go on holiday in August*. When the word obligated was used, individuals mentally envisaged the possibility of a worker being on holiday in August. When the word forbidden was used, participants envisaged a worker on holiday not in August (cf. Byrne, 2005); individuals represented a worker on holiday with a mental footnote denying such possibility.

Castro, Moreno-Ríos, Tornay, and Vargas (2008) followed this logic to account for faster reaction times to evaluate a permitted or non-permitted maneuver at a road junction. By using obligatory or prohibitory, directional traffic signs, a car turn was signed beforehand. Results showed that participants were faster to evaluate a maneuver as permitted when the turn was signaled with an obligatory sign and as non-permitted when the sign was prohibitory. Participants represent obligatory turns by envisaging themselves turning in the correct direction. This is the reason why it is easier for individuals to evaluate a maneuver as permitted than as non-permitted when the maneuver is actually permitted. However, participants represent prohibitory turns by envisaging themselves turning in the direction pointed by the sign plus the label prohibitory information (by means of an attached mental footnote denying such possibility). Therefore, with prohibitory signs, participants are faster evaluating a maneuver as non-permitted than as permitted when the turn is actually non-permitted.

Vilchez (2015) tested the effect of the implicit information provided by the mental footnotes (attached to mental models) on movement. By using obligatory and prohibitory signs in a tracking task, the obligation or prohibition of taking a route in a road junction was signaled beforehand. The results showed an initial repulsive effect when presenting the sign. Participants displaced themselves significantly to the opposite side of the route that they were mentally representing to take. That is to say, if participants represented that they had to take the route, for example, on the left, initially they veered significantly to the right. Conversely, when individuals represented themselves having to take the route on the right, initially they veered to the left. Vilchez used the concepts of the mental model of Where I have to go and the influence of

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the mental footnote of Not yet over that particular mental model to account for the results obtained. The direction of the effect was explained based on Carpenter’s (1852) concept of ideomotor phenomenon. In this sense, when individuals represent a movement, they activate the cognitive system just as if they were carrying out that movement. In this particular case, participants represented the obligation of taking one of the two routes but the mental footnote added the implicit meaning concerning that that particular representation-decision was not suitable yet. Consequently, this additional information – in form of an implicit mental footnote – initially made participants first imagine and then carry out a veer-away movement from the route that they had to take afterwards.

The nature of mental footnotes

It is unknown how long mental footnotes remain in the system or how wide their influence is. Mental footnotes are proposed to underlie more stable thinking modes such as attitudes. In other words, these pieces of information are set out to be the general framework where other kinds of thinking take place, as the color of the glass we look through (in terms of Shrauger & Schoeneman, 1979). In general terms, after every single reasoning, just mental footnotes remain active, as the conclusion or output of that information processing. These outputs accumulate and remain in the system as a joint between one thought and the next one, determining our daily life and, in turn, our essence.

In order to restructure these outputs of reasoning, it is necessary to restart the whole process, fathoming the premises represented and reasoned through the mental models that yielded those mental footnotes. However, the functioning of mental footnotes is not necessarily and continuously conscious, as it is not reasoning itself (e.g., Vilchez & Tornay, 2012). Mental footnotes are present in the system in a more automatic manner, such as other cognitive processes (Hasher & Zacks, 1979). These frameworks unconsciously shape our mental schemata to give sense to the world around us. Mental footnotes become unconscious-automatic, metacognitive beliefs (Wells, 1997), which determine even the emotional information we will recall in the future (Bower, 1981), with emotional correlates closer to moods than just emotional reactions.

Overall, mental footnotes define our spotlight of attention (in terms of Posner, 1980), the manner of accommodating and assimilating new information into our knowledge (Beck, 1976), the decisions we make (Falzer, 2004), and the emotions that are triggered (Bower, 1981) – even the most automatic ones such as the micro expressions (in terms of Ekman, 1965).

The activation of mental footnotes means a shortcut of reasoning without unleashing the entire process, becoming heuristics that do not just solve problems but save mental resources (Simon, 1955). The conclusion of the process (in form of mental footnote) is linked to one of its very first premises, jumping to the output without completing every step in the sequence of reasoning. The function is similar to a simple arithmetic operation in which it is not necessary to break down every single mathematical sub-operation to reach the correct answer.

Occasionally, it is not even possible to remember how mental footnotes were established. Even when we do not know from where those mental footnotes came, mental footnotes can alter our daily functioning. If these disturbing footnotes are retained for a length of time, the system can collapse. That singularity seems to be behind the fact that individuals with depression disorders are likely to sleep more than usual (Watson et al., 2014), as a means to disconnect for a period. This necessity of disengaging the central executive (in terms of Baddeley & Hitch, 1974) can explain many substance abuses. In this sense, psilocin – present in most psychedelic mushrooms – has been proven to have an effect on the ego dissolution (e.g., Studerer, Kometer, Hasler, & Wollenweider, 2011) and, therefore, helps to erase mental footnotes for a while. However, it is also possible to give the system a rest using techniques that are more personal. To this aim, mindfulness meditation has been applied in the treatment of depression (e.g., Teasdale et al., 2000).

Examples of mental footnotes in common psychopathological problems

Suffering here [India] is much more physical, much more material, but in some other places [western world], where our sisters are working, suffering is much deeper and also more hidden.

Mother Teresa (Petrie & Petrie, 2004)

Nowadays, it is common to find individuals with mood or anxiety disorders. In these cases, persons who are by their side can perceive the mental footnotes that are activated in these individuals’ mind. A continuous repetition of the same sentences is the behavioral expression of what is mentally being processed. The psychopathological mental processes eventually arise in form of particular manifestations. These embodiments objectify in form of either complexes-leading-to-omissions or overcompensations (in terms of Freud, 1954)-leading-to-commissions. Bipolar disorder [Diagnostic and Statistical Manual of Mental Disorders, 5th ed. (DSM-5)]; American Psychiatric Association, 2013) is the clearest example of both kinds of I’m a looser and I’m the best footnotes and their respective behavioral manifestations contingently present in the same syndrome (Hergueta & Weilier, 2013).

The nature of mental footnotes can be used as criterion to define and classify other common mental disorders. In obsessive disorder (Shin, Lee, Kim, & Kwon, 2013), for instance, a permanent mental footnote of Something is going to go wrong is present. These catastrophic footnotes are constantly active in individuals with this mode of think-
The intrusion of harmful thoughts interferes with other cognitive processes and makes individuals recall states of affairs of worry or apprehension. Just the mere act of thinking become the main problem. The consequence of this ruminating thinking – in form of the interchange of noxious mental models and footnotes – is a rise of anxiety. This faulty processing of information can turn into the compulsion of carrying out particular behavioral rituals under the new mental footnote of If I do this, I’m solving the problem (the problem or thought that they cannot mentally control). These rituals permanently establish in individuals’ behavior as the only clear solution for patients to reduce their anxiety.

On the other hand, in Diogenes syndrome (e.g., Clark, Mankikar, & Gray, 1975), the mental footnote constantly present is one of the kind of This could be useful later (Carrato Vaz & Martínez Amoros, 2010). This kind of evaluation makes individuals with this syndrome employ a just-one-way criterion of I’ll hang on to it before every decision of keeping or not keeping a particular object. This tendency to hoard is related to anxiety problems, such as panic attacks and social, specific or generalized anxiety disorders (e.g., American Psychiatric Association, 2013). In this sense, the tendency to hoard in these kinds of cases is not just physical but mental as well; accumulating mental footnotes that trigger mental models of fear (e.g., Something bad is going to happen if I don’t keep it). In this sense, we can clean our mind of mental footnotes, likewise we can clean the physical space.

As other example, the theory of mind (Premack & Woodruff, 1978) postulates the ability of individuals to attribute mental states, such as beliefs, desires, intentions, or knowledge, to oneself and others. This mental processing relies on the capacity to understand that those thoughts are different from ours. The incapability of processing the information in such a way has been associated with schizophrenia (e.g., Cassetta & Goghar, 2014). Persons with schizophrenia possess a malfunction in recognizing their own thoughts. This inability is the reason why schizophrenics attribute the origin of information they receive to an external source. This misled designation of the source of information sticks in an individual’s mind as mental footnotes such as If what I’m hearing inside my head are not my thoughts, it is because somebody is talking to me.

In eating disorders, the problem has been related to the necessity of thought suppression (Collins, Fisher, Stojel, & Becker, 2014). Following an extremely stressful situation (such as rape), individuals experience learned helplessness (in terms of Seligman, 1975). In these cases, a necessity to increase the individuals’ sense of control over their life – through controlling what they ingest – is reported (Garcia Alba, 2003); these persons use this mode of thinking as a coping mechanism. The mental footnote in this case is If I can control this, I can control anything.

Finally, psychosomatic disorders are the clearest example of how the dysfunction of our thinking can provoke structural damage in our own body. Incapacity for concrete thinking or for controlling thoughts activates the involuntary nervous system and the endocrine glands inappropriately (Gil Lemus, 2008). Taking this mind-body connection into account, some treatments of these disorders have been oriented to cancel the thinking in which preverbal constructs (or, in other words, mental footnotes) embody the symptoms (YuChi & Payne, 2014).

**Mental footnotes in normal mental problems**

Material poverty you can always satisfy it with material (...) the unwanted, the unloved, the uncared, the forgotten, the lonely (...) this is much greater poverty (...) the loneliness of the agony, the loneliness of being rejected, the loneliness of being left alone [Chris] (...) I think today we see that loneliness being relived in many, many rich countries where people are being tortured or being unwanted, rejected (...) and I think this is the greatest, greatest suffering and the greatest poverty today.

Mother Teresa (Petrie & Petrie, 2004)

It is impossible to define what is normal and what is not. Taking a statistical criterion, all the current killing, murdering, raping, robbery, and other unfortunate human actions would become normal behavior. On the other hand, taking the severe interference of a mode of thinking in the individuals’ daily life, it is clear that the aforementioned syndromes (American Psychiatric Association, 2013) are not normal, but serious and more widely well known. However, it is not a sine qua non condition to be diagnosed with a psychological pathology to be unhappy.

In any given social interaction, individuals can usually and readily modify their self-conceptions in response to interpersonal feedback (e.g., Shrauger & Schoeneman, 1979). In this sense, there is an inherent tendency in human kind to know who we are from what other people think of us. This symbolic interactionism allows mental footnotes to be set up in our mind from external sources as well, and not only from our own mere experience. The danger with this open possibility of assimilating alienated mental footnotes comes from, inter alia, toxic relationships (Carruthers, 2011), in which one of the two element of the microsystem lives for the other and rules their world. This dynamic makes one of the members (the victim) to build up the representation of their reality based on unrealistic and on-the-other’s-demands mental footnotes. In this kind of relationship, the toxic element runs the relationship, in the attempt to fix the victim element (McBride, 2011). Acting on this manner, mental footnotes (I need to please him/her) are generated, placed and stuck in the victim’s mind. Individuals who suffer this kind of circumstance eventually forget their desires, interests or beliefs in order to accommodate themselves to the necessities of the other; they forget the mental footnotes that make them unique.

Once this dynamic is in action, in the interest of an un-
real perfection, toxic individuals continuously blame their partner to justify the manners they have or how harsh they are (Carruthers, 2011). These individuals use both passive aggression (as their normal way to communicate) and emotional blackmail, when they do not receive what they want. The more negative footnotes based on simply normal (or even unreal mistakes continuously reminded by toxic individuals) are present in the victim’s mind, the more mental models of other failures will be active as well. In turn, the more negative mental models that are triggered, the more negative mental footnotes will be generated and left active in the system. This functioning forms a vicious circle or an associative emotional semantic network (in terms of Bower, 1981).

In the opposite extreme of interactive situations, individuals seek social contact not only for obtaining positive feedback but also for eliciting responses in others that are in line with their own previous expectation in order to confirm these beliefs (Swann & Read, 1981). As an example, in a recall test, participants significantly remembered more information that confirmed their self-conceptions than other irrelevant facts or in contrast to their line of thinking. This natural necessity of continuously self-verifying our mental footnotes can lead us to an unsatisfying life. In individuals, whose mental footnote is I’m depressed, a constant scrutiny of their body in search of signs of depression (such as lethargy, tiredness or lack of energy) is reported (Swann, Wenzlaff, & Tafarodi, 1992). In therapy, this point is one of the most complicated issues to get beyond the vicious circle that means depression. The interruption of this cyclic thinking must begin by erasing the mental footnote that constantly reminds us that I’m not well.

**Functioning of mental footnotes in personal beliefs**

The constant checking of ourselves is common to all humankind. There is a scientist in us, who is unceasingly testing our falsifiable hypotheses (in terms of Popper, 1959) about ourselves. The aim of this acting mode is to support our self-concept and beliefs with both data and concrete examples. In this sense, the circumstances that cause offense to individuals are meaningful. In these situations, it is obvious that a sensitive topic has been mentioned related to others’ self-representation. In most cases, the comment connects to some thought [in the form of an alternative hypothesis (in terms of Popper, 1959) about themselves], which has been previously instilled and does not conform to the rest of their self-concept. This alternative hypothesis about oneself will have been attempted to be refuted in the past, nevertheless, its reactivation in the system means the necessity of collecting new data once again, in order to contrast new information to the re-active mental footnote. The emotion associated to this lack of consistency (between our beliefs and what other people think of us) is what makes the individual restart checking if that comment was conceptually true.

These tests lead to overcompensation in the attempt to show ourselves the falseness of that instilled idea. Take the example of the person who has been overweight and is currently fit, and shows their fitness with any opportunity. When checking our hypotheses, humans are not objective (e.g., Swann & Read, 1981). In this obsessive checking to discover the truth, it is where cognitive restructuring (e.g., Beck, 1976) must take place and the guide of a psychotherapist is most needed.

In the path of discovering oneself by recollecting data, psychoanalysis (e.g., Freud, 1936) can represent a misleading means for accomplishing this task. Since memory is a non-relentless mechanism (Schacter, 2001), in flashbacks, psychoanalysts (with no particular intention) can modify memories. This influence might alter the way individuals reconstruct their knowledge of a specific situation. In this environment, it is easy to unintentionally introduce external mental footnotes that were not originally implanted in the mind of the individual. Those footnotes, which do not represent us, can stick in our self-representation and occupy the place of our true desires or identity.

**Consequences of mental footnotes functioning**

External mental footnotes can radically influence in our life expectations and, in turn, affect our mood. The so-called Madam Bovary syndrome (Bouchier, 2004) is the chronic life dissatisfaction state caused by the continuous comparison between the wishful thinking and the own reality that frustrates those aspirations. These unreal mental footnotes are given; they do not respond to a true necessity, nevertheless, they have an effect in our emotion. This constant, vital discontent can degenerate into a depression, since the individual lives in a continuous disappointment. In this sense, media (e.g., Time: http://time.com/) are bombarding with social models en masse. These I-have-to-belike or hero archetypes (in terms of Jung, 2009) condition the evaluation of our vital performance, wishing always something that we do not have or being in some other place. We can fall in a state of I will never reach that or I’m not good enough for (…) that avoids our self-development.

Independently of what is causing us emotional pain, individuals need to identify the mental footnote that make persons be themselves. The sequential, indiscriminate acquisition of external mental footnotes can make us not recognize ourselves. This incapability of differentiating our own forgotten desires is caused by the difficulty of distinguishing our identity from those mental footnotes that do not intrinsically belong to us and have been placed in our mind from external sources. If we take no action, alienated footnotes overflow and accumulate in our mind as the mental version of the Diogenes syndrome (disorder characterized by extreme self-neglect and compulsive
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The bases for therapy based on mental footnotes

The importance of faulty reasoning is relevant for our daily life. In accordance with Beck (1976), all psychological illnesses come from either invalid reasoning or reasoning based on misconceptions or false beliefs. This principle bases an entire psychotherapeutic approach in the form of, inter alia, the rational emotive therapy (e.g., Ellis, 1958, 1962) or just cognitive therapy (e.g., Beck, 1967). Although invalid reasoning is taken in the past, it is in the present moment when this defective processing of information has to be restructured. Both rational emotive and cognitive therapy are conceptually distant from other tendencies that are more focused on the past or unconscious processes (e.g., Freud, 1954). In this sense, it is established that memory is an imperfect mechanism that does not allow us to infallibly remember what has accurately happened in our personal history. Either for omission (i.e., actions that memory does not take) or for commission (i.e., actions that memory carries out incorrectly), memory tricks and misleads us to the wrong conclusion when committing its sins (in terms of Scharter, 2001).

Instead of attempting therapy, a number of individuals try to erase all those disrupting mental footnotes with alcohol or illegal drugs (Weiner, Sussman, Sun, & Dent, 2005), which are not different from medical drugs (Marinoff, 1999); in terms of the necessity of persons to obtain extra help to get beyond their problems. Independently of how misconceptions were originally generated, therapy represents an effective means to restart the chain of this kind of reasoning in order to reach another conclusion, and so leave active other more positive mental footnotes.

Therapy based on mental footnotes

Mental footnotes are proposed to be sequential in the track of thoughts and be the implicit joint that makes think-
ment provide. Constructivism affirms the more we know about how those concepts work, the more we can control them; the better knowledge we have, the freer we will be. How society can influence in the creation and maintenance of determined mental footnotes for controlling the mass will be the topic of future works. The pain humans unnecessarily self-inflict by using one mental footnote or another, the means we use to self-develop based on those mental footnotes, and how to change our inner self to abandon our miseries as humans will be analyzed. The aim of constructivism approach to psychotherapy is to burn all those mental footnotes that smoother our real essence. By doing so, we change our own world, the one we can really manipulate (Steg & Vlek, 2009).

### References


