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1 Section IV

2 **Mechanisms of cognitive**
3 **control**







1 Chapter 18

2 **On unconscious inhibition: Instantiating**
3 **repression in the brain**

4 Ariane Bazan and Michael Snodgrass

5 **Abstract**

6 In psychodynamic theory, repression is a major neurotic defence mechanism,
7 which operates by separating the drive investment from the conflictual
8 representation. While major insights in unconscious processing have recently been
9 obtained in the cognitive neurosciences, repression as a psychological mechanism
10 remains controversial. In this chapter, we present empirical results obtained with
11 subliminal priming paradigms concerning unconscious inhibition of (1) mental
12 representations and (2) motor control. For these paradigms, we propose that only
13 under very stringent subliminal conditions where stimuli are completely
14 undetectable, the dynamics of deep unconscious processing—which are
15 structurally sensitive to subject factors such as defensivity and anxiety—are
16 discernable. We also present parallel results of (3) suppression and inhibition in
17 memory and language processing. A similar observation in these various results is
18 that inhibition reveals itself by spilling over to associated elements which were not
19 its original targets. Finally, we propose a speculative model on the physiology of
20 repression. First, we present a series of arguments indicating a conceptual
21 closeness between the ‘indications of reality’ in the Freudian model and the
22 efference copies of the sensorimotor models. Moreover, a number of other
23 parallels between the psychodynamic and the sensorimotor approach have been
24 uncovered in recent neurosciences, chief among which is the constitutive link
25 between representation and action: thinking is only possible as a motor activity
26 and this thinking is not a priori conscious. Afferent stimuli probe for a multiplicity
27 of associated action plans: directed action, then, is only possible by selecting one
28 alternative through inhibition of the others. This inhibition might function through
29 the anticipative attenuation brought about by the efference copies. The efference
30 copy-induced somatosensory activations linked to motor control are thought to
31 induce mental imagery in response to incomplete action execution. This, then,
32 would be especially the case for some of these action alternatives, which are easily
33 susceptible of popping up due to their emotional importance. In order to act
34 appropriately, these frequent candidates require a more vigorous inhibition, which
35 would then be particularly prone to induce (unconscious) mental imagery as well
36 as to spill over to associated representations and induce substitutive behaviours,
37 which, together, would constitute ‘the return of the repressed’.

38 *Keywords:* repression; inhibition; unconscious; subliminal; sensorimotor.





1 Introduction

2 The concept of the ‘dynamic unconscious’ is a major bedrock of psychoanalytic theory. This
3 unconscious (see Box 18.1) is said to be dynamic because it results from the dynamic process of
4 repression. While major insights in unconscious processing have been obtained these past
5 10 years in cognitive neurosciences, the possibility of repression as a psychological mechanism
6 remains controversial. However, Freud himself qualifies repression as ‘the corner-stone on which
7 the whole structure of psychoanalysis rests’ (1914, p. 16). In this chapter, we briefly spell out the
8 metapsychology of repression in Freudian theory, we overview experimental results on uncon-
9 scious processing in the areas of defence and inhibition, and we present some tentative ways to
10 understand repression in physiological terms.

Box 18.1 Term definitions

The adjective ‘*unconscious*’: This term refers to those contents that are not present in conscious-
ness and more broadly, to those features of mental life of which people are not subjectively aware.
Here unconscious is used in a descriptive way and not in a topographical way. In Freud’s first
topography (1900) of the mental apparatus the following distinctions are made: that which is
present in our minds is conscious; that which is not present but retrievable in memory is pre-
conscious; that which is not retrievable by conscious will is unconscious. Hence, the ‘descriptive
unconscious’ does not discriminate between, for example, preconscious and unconscious con-
tents. (further reading see Freud, 1912, 1915b; Laplanche and Pontalis, 1974; Person et al., 2005).

Dynamic unconscious: This term is a more specific construct and refers to mental contents that
are defensively removed from consciousness as a result of repression. The dynamic uncon-
scious is not unconscious because there is no conscious will to retrieve it, but because there is
an active blockade of the access to consciousness. The term reflects the idea that psychical life
is in conflict, this is the dynamic point of view; this conflict can be considered in very general
terms as an intrapsychic conflict between the drives (the biological level) and the internalized
social constraints (the social level). (further reading see de Mijolla, 2005; Freud, 1915a,b;
Laplanche and Pontalis, 1974; Person et al., 2005).

System unconscious (Ucs.): This term denotes the idea of a system of unconscious contents,
organized by principles different from those of the conscious mind. The Ucs. includes both
‘wishful impulses’ derived from the drives, and the repressed materials. This system is cathected
(or invested) by free-flowing energy (called ‘libido’ or drive energy), operates along the logic
of primary process thinking, such as condensation and displacement, and is governed by the
pleasure principle. The Ucs. is left rather vague, but later on Freud uses this to describe his
second topography (1923), his tripartite model of the mind as id, ego, and superego, where the id
incorporates the Ucs. and inherits its characteristics, while the assets of the adjective ‘unconscious’
accrue from the id and to a large extent from the ego. (further reading see de Mijolla, 2005;
Freud, 1900, 1923; Laplanche and Pontalis, 1974; Person et al., 2005).

Defence mechanisms: These are psychic transformation processes which organize and maintain
optimal psychic conditions by attempting to keep anxiety levels as low as possible in response to
experiences that generate conflict in general and, more specifically, in response to experiences
that are painful, intolerable, or unacceptable. Defence then is a general designation for diverse
specific mental mechanisms deployed in response to conflict including repression, introjection
(or identification), projection, denial, forclusion, sublimation, reaction-formation, isolation.
(further reading see de Mijolla, 2005; Laplanche and Pontalis, 1974; Person et al., 2005).



**Box 18.1 Term definitions (continued)**

Repression: This is a specific form of defence. Initially described in conjunction with hysteria, repression plays a major role in neurosis in general, including in normal psychic activity. It can be considered a universal psychic process insofar as it is constitutive of the dynamic unconscious. Repression operates by blocking action upon a representation which generates conflict. The associated affective or drive investment—this is the quantitative or energetic factor—is separated from the representation and both have different fates in the psyche. In hysteria, the quantum (re-)invests the body, causing conversion symptoms, in obsessional neurosis, it is attached to other, seemingly unconnected ideas, causing them to become obsessional. Thus the neurotic symptoms constitute the ‘return of the repressed’. The representations, having lost their investments, are now unconscious and are said to be repressed. (further reading see de Mijolla, 2005; ~~Laplanche and Pontalis, 1974; Person et al., 2005~~)

Inhibition: This term in general, refers to blockage of action: indeed, actions can be initiated and then cancelled; this is the ‘physical-response’ concept of inhibition. In the present text, the term is not in the first place used in its psychodynamic sense as the constraint or curtailment of impulses or desires. Rather, it is used as referring to its diverse neuroscientific meanings as the opposite of facilitation or excitation; eventually it refers to the reduction of activity as the result of an antagonistic stimulation state created at synapses making them less excitable by other sources of stimulation. The important characteristic feature for inhibition, then, is its dimension of ‘subtraction’ or ‘negative effect’: at the level of the synapses this is realized by hyperpolarization, while activation or excitation involves depolarization.

~~References and further reading see de Mijolla, 2005; Eagle, 2000a,b; Freud, 1900, 1912, 1915a,b, 1923; Kandel et al., 1991; Laplanche and Pontalis, 1974; Le Guen, 1992; Le Guen et al., 1986; Logan and Cowan, 1984; Person et al., 2005.~~

1 Metapsychology of Freudian repression

2 In his metapsychological article ‘The unconscious’, Freud proposes: ‘The nucleus of the *Ucs.* [the
3 system unconscious] consists of of instinctual [drive] representatives—*Vorstellungsrepräsentanzen*—
4 ~~of the drive~~ which seek to discharge their cathexis; that is to say, it consists of wishful impulses’
5 (1915b, p. 186). Sources of the drives are the states of need of the inner body, such as tissue dehy-
6 dration. While the drive might still be conceived of as a tension of the inner body, the
7 *Vorstellungsrepräsentanz* or *representance*¹ is the first real mental breakthrough. To this representance,
8 a content value in response to the need can be ascribed. For example, the content might be ‘thirst’
9 or ‘wanting to drink’. It is then this content which gets represented. For example, the content of
10 ‘thirst’ might get represented by the baby with a cry *if* his mother was able to interpret the cry
11 more or less satisfyingly by feeding the baby (see Figure 18.1). In this case the baby’s cry becomes an
12 adequate act. Or it might get represented by the idea of taking a glass of water or by the question
13 addressed to someone asking for a drink, etc. These representations are then concrete action
14 plans adapted to the subject, his actual state, and the context. In other words, while the represent-
15 ance strives for an alleviation of thirst, responding in content to the drive arising from the inner

¹ Freud writes *Repräsentanz*, which is translated as ‘representative’ but of which the translator and editor Strachey says that ‘it would be better rendered by ‘representance’ if it existed . . .’ (Strachey, 1957, p. 112). In French this term is often translated as ‘représentance’ (see e.g. Roussillon, 2007). To remain close to Freud’s choice for the word *Repräsentanz* and to avoid confusion between *Repräsentanz* and *Représentant* (which is also translated as ‘representative’), we have chosen to use the form ‘representance’.



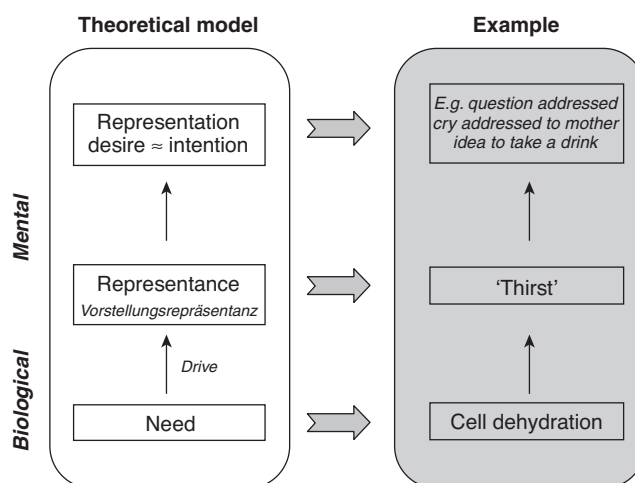


Fig. 18.1 Logical distinctions between drive and representation (action plan) and the shift from biological to mental.

1 body, the concrete representations of the representance strive for a new external body configura-
 2 tion, such as the right position of the head towards the breast, or the grasp position of the arm, etc.
 3 Freud's *dynamic* unconscious (see also Northoff (Chapter 15) and Solms and Zellner (Chapter 12),
 4 this volume) is said to be dynamic because it results from repression; this repression can be consid-
 5 ered as the consequence of a conflict between the drives on the one hand and the social constraints
 6 on the other (i.e. the mental level arises from tension between the biological and the social level).
 7 The drive in itself can not be repressed, only the 'wishful impulses' can. This repression implies
 8 that the representations of the representance are prevented from being executed or spoken. Freud
 9 says: 'A presentation which is not put into words, or a psychical act which is not hypercatheted,
 10 remains thereafter in the Ucs.' (1915b, p. 186). Without these representations, the subject loses
 11 the means to become aware of this drive: this content then remains unconscious. But Freud adds:
 12 'it is a mistake to emphasize only the repulsion which operates from the direction of the conscious
 13 upon what is to be repressed. Quite as important is the attraction exercised by what was primarily
 14 repressed upon everything with which it can establish a connection'. Indeed: 'repression does not
 15 hinder the drive representative from continuing to exist in the unconscious, from organizing
 16 itself further, putting out derivatives and establishing connections' (1915a, p. 149). In other words,
 17 the withdrawal of cathexis at the level of certain representations implies the over-investment of
 18 associated substitutive representations: 'If these derivatives have become sufficiently far removed
 19 from the repressed representative, whether owing to the adoption of distortions or by reason of
 20 the number of intermediate links inserted, they have free access to the conscious' (Freud, 1915b,
 21 p. 149).² This over-investment of substitutive representations is called 'the return of the repressed'

² One way in which derivatives can be at the same time connected to and far removed from the original wishful impulse, is by deviating mental investment into word representations with a similar form but a radically different meaning: 'The ideas which transfer their intensities to each other stand in the loosest mutual relations. They are linked by associations of a kind that is scorned by our normal thinking and relegated to the use of jokes. In particular, we find associations based on homonyms and verbal similarities treated as equal in value to the rest' (Freud, 1900, p. 596; for an account of a possible physiological interpretation of this mechanism, see Bazan, 2007a, in press).

1 (Freud, 1915a, p. 154). But action upon these substitutes is unable to alleviate the drive tensions of
2 the inner body, which will keep on insisting, while the subject has no means to become knowl-
3 edgeable of what moves him. This is a brief outline of the dynamic principles of Freudian
4 repression.³

5 ~~A state of need of the internal body (e.g. cellular dehydration) yields an insisting and peremptory~~
6 ~~excitation corresponding to a drive. The first breakthrough of this drive at the mental level, then, is~~
7 ~~the ‘representance’, to which a content value in response to the need can be ascribed (e.g. ‘thirst’).~~
8 ~~It is then this content which is translated into concrete actions plans of the external body, which~~
9 ~~are response alternatives to the internal state of need (e.g. to ask for or to take a glass of water). If~~
10 ~~these actions are effective in alleviating the original state of need, they become adequate acts. These~~
11 ~~action plans or intentions (or desires), derived from the drive, correspond with representations at~~
12 ~~the mental level (see Jeannerod, 1994).~~

13 **Empirical results pertaining to the issue of repression**

14 **Unconscious inhibition of mental representations**

15 **A methodology to study unconscious mental processes**

16 Contrary to what was assumed in cognitive neuroscience, unconscious processing research by
17 *subliminal priming* (Dehaene et al., 1998; Greenwald et al., 1996) was able to show that uncon-
18 scious processes are not limited to automatic or ‘dumb’ operations (e.g. Greenwald, 1992; Loftus
19 and Klinger, 1992). The *priming* paradigm presents a first stimulus, the prime, and measures its
20 influence on a second stimulus, the target (Segal and Cofer, 1960). When the prime is shown
21 below a certain threshold—or *limen*—related to consciousness, the priming is said to be *subliminal*.
22 The subliminal threshold for visual stimuli is obtained by reducing the presentation time.
23 A tachistoscope (see Figure 18.2) is a mechanical device that allows reducing presentation times
24 to a thousandth of a second or less (see below section on ‘Robust inhibition results as a function
25 of individual differences’). Even at these low presentation times, the stimulus tends to persist in
26 the participant’s visual iconic memory for a time after it has physically disappeared (Sperling,
27 1960) and it may therefore attain conscious awareness. To overwrite this visual buffer, so that the
28 effective presentation duration is the same as its actual duration, a *mask* is used. In tachistoscopic
29 procedures, at very low presentation times, an energy mask is often sufficient: this energy mask
30 then simply consists of a blank field that is either brighter than the previous subliminal field or is
31 on for a longer period of time, thus resulting in a greater amount of light energy hitting the eye.

32 However, due their refresh rates, presentation times on computer screens cannot be reduced as
33 much and hence, a pattern mask containing similar features as the prime is presented, overwriting
34 the prime on the display (Turvey, 1973; Marcel, 1983). Primes can also be embedded in sandwich
35 masking, a rapid sequential presentation in which the prime is preceded and followed by a mask.
36 Prime duration for subliminal priming in these kinds of set-ups typically varies between 20 and
37 50 ms. Subliminal perception is inferred when a stimulus is demonstrated to be invisible while
38 still influencing thoughts, feelings, actions, learning, or memory. In other words, to demonstrate
39 unconscious influences the *dissociation paradigm* (Erdelyi, 1985, 1986) is used, which compares
40 performance on two tasks, a direct discrimination task (e.g. detection) or *conscious perception*
41 *index* (CPI) and an indirect task requiring more complex processing (e.g. semantic priming) or
42 *unconscious perception index* (UPI). The dissociation paradigm shows unconscious processing if

³ For a more thorough and complete overview on repression we refer to Freud (1915a,b), Le Guen (1992),
Le Guen et al. (1986), and Eagle (2000a,b).



Fig. 18.2 A participant looking through a tachistoscope (three-channel Gebrandt T-scope) in the Shevrin lab (7 April 2009). The cards carrying the visual stimuli are individually lighted by neon light tubes at the side. Time and sequencing are monitored by a computer.
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1 positive effects are obtained on the UPI despite null sensitivity on the CPI. Concretely, if, for
2 example, semantic effects are obtained despite demonstrable absence of detection, then these
3 semantic effects are shown to be unconscious.

4 Subliminal priming shows high-level unconscious mental operations

5 Subliminal perception research has a long-standing history of more than a century, an excellent
6 review of which has been published by Kouider and Dehaene (2007). This history has repeatedly
7 been dominated by methodological debates. In 1960, Eriksen proposed that the subjective (intro-
8 spective) measures of conscious perception were unreliable and he replaced them by an objective
9 index defined as a situation where *forced-choice discrimination* is at chance. Instead of asking par-
10 ticipants to subjectively report a direct measure (e.g. to identify the stimulus), they are put before
11 a forced choice, obliging them to respond to the best of their abilities even if they feel unsure. If
12 these forced choice responses have no correlation with the actual presentations, null sensitivity on
13 the direct CPI task is established (see also section on ‘Robust inhibition results as a function of
14 individual differences’). An indirect UPI measure is subsequently used to show that, nevertheless,
15 this stimulus still influences behaviour. In 1986, Holender published an intensively argued criticism
16 of masked priming in which he stated that the issue of awareness was still largely underestimated
17 and in which he stressed the need to carefully control the methods. Moreover, with the advent of
18 signal detection theory (SDT),⁴ Merikle (1982) argued that the small sample of items frequently
19 used to evaluate the threshold for conscious perception was not statistically reliable.

⁴ Signal detection theory (SDT; e.g. Green and Swets, 1966) is a mathematical theory that enables to quantify the ability to discern between signal and noise. It characterizes not only the acuity of an individual’s discrimination but it also suggests that individuals are actively involved in the response so that it depends not only on the subject’s ability to discriminate between the signal and noise, but also on the subject’s response bias or response criterion.



1 Thanks to these studies, new and stronger paradigms of subliminal priming emerged with
2 important methodological improvements leading to subliminal priming studies showing high-
3 level mental processes. In the study of Dehaene and colleagues (1998), subjects classified numbers
4 as smaller or larger than the reference number 5. These numbers were preceded by subliminal
5 number primes that are also smaller or larger than 5; subjects were faster when both the prime
6 and the target belong to the same category. Dell'Acqua and Grainger (1999) asked participants to
7 categorize pictures of objects as referring to living things or artefacts; a prime-target congruity
8 effect is found, which cannot be explained by methodological artefacts or alternative hypotheses
9 and which therefore demonstrates a genuine subliminal lexical, if not semantic, effect. Moreover,
10 using 'event-related potentials' (ERPs) as a brain measure, Kiefer and Brendel (2006) indicated that
11 subliminal priming is reflected in the N400 component, which is an ERP component indicative of
12 either lexical or semantic integration of information. Dehaene and colleagues (2001) and Devlin and
13 colleagues (2004) showed that the left occipitotemporal region is sensitive to repetition priming
14 from masked words, independently of the case in which words are presented, and with a sensitivity
15 to orthographic similarity. The left middle temporal gyrus is sensitive to priming by synonym
16 words (Devlin et al., 2004) as well as priming by repetition of words presented in the Kanji and
17 Kana Japanese writing systems (Nakamura et al. 2005), suggesting that this region encodes words
18 at a semantic level. For numbers, Naccache and Dehaene (2001) observed a brain imagery effect in
19 bilateral intraparietal cortices, at a site thought to encode numerical magnitudes, thereby suggestive
20 of true semantic activation by the subliminal primes. Naccache et al. (2005) also found that
21 masked words that are threatening increase the activity in the amygdala compared with neutral
22 words, while subjects are totally at chance in categorizing these masked words as threatening or
23 neutral. In conclusion, a body of evidence has accumulated in the domain of subliminal priming
24 showing the existence of high-level perceptual, arithmetic, lexical, affective, and possibly semantic
25 processes (see also Kouider and Dehaene, 2007).

26 Subliminal priming research at the subjective detection threshold: the 27 impossibility of unconscious inhibition of mental representations?

28 However, these findings do not demonstrate the Freudian unconscious of psychoanalysis, which
29 is first and foremost a *dynamic* unconscious, meaning that it results from repression. However, not
30 only is there no report of inhibitory phenomena in the body of the results summarized so far, but,
31 it seems that results in the domain of subliminal priming, using the so-called exclusion paradigm
32 (Jacoby et al., 1992), show the impossibility of unconscious inhibition. In a typical exclusion task,
33 subjects have to produce any word that comes to mind starting with, for example, the fragment
34 YE (i.e. completing a stem target), but they are instructed to avoid the prime word, for example
35 'yellow'. Debner and Jacoby (1994) have shown that exclusion is no longer possible with subliminal
36 primes (see also Merikle et al., 1995). Instead, subjects complete the fragment with the prime word
37 with higher likelihood than if they are not presented with a word at all. The idea that inhibition
38 requires consciousness seems to be supported by other studies too (for review, see Lau, 2009),
39 including a case study by Persaud and Cowey (2008) of a patient with 'blindsight'. This 'subject-
40 tively blind' patient with a lesion to the left primary visual cortex can still discriminate stimuli well
41 above chance level in his blind field in forced-choice situation, but when required to perform an
42 exclusion task, that is, to say the location where the target was *not* presented, he failed to do so in
43 his blind field. Remarkably, he was significantly worse than chance in this field, as if the stimulus
44 drove the response directly and inflexibly. This seems to support the account that consciousness
45 is required for exclusion. The failure to exclude subliminal primes while being influenced by
46 them, then, suggests both a process-dissociation between conscious and subliminal perception,
47 and the impossibility of inhibition has been considered the hallmark of unconscious processing
48 (Debner and Jacoby, 1994; Jacoby et al., 1992; Merikle et al., 2001).



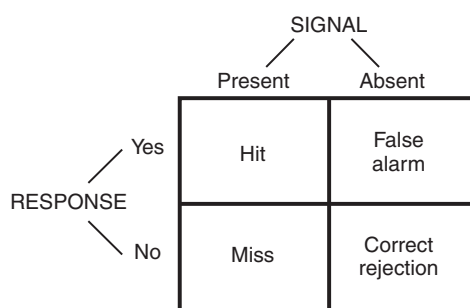


Fig. 18.3 Calculation of hits and false alarms in detection experiments.

1 However, Snodgrass (2002) has rebutted this exclusion failure argument arguing that these
 2 results at the *subjective* detection threshold do not reflect true unconscious processing. Exclusion
 3 failure arises from the differential application of exclusion instructions to *weakly conscious stimuli*
 4 as a function of confidence. Indeed, exclusion instructions explicitly tell subjects to exclude
 5 responses only if they feel they saw the preceding word. If not, they actually are to respond with
 6 the ‘first word that comes to mind’. In other words, the instruction implies that people don’t
 7 exclude at low confidence. This account predicts that exclusion failure should disappear if subjects
 8 are instead encouraged to exclude even low-confidence stimuli (for example by offering monetary
 9 rewards) which is precisely what was shown by Visser and Merikle (1999). Moreover, when working
 10 at the more stringent *objective* detection threshold, inhibition results in true unconscious processing
 11 can indeed be uncovered (see below).

12 **Robust inhibition results as a function of individual differences with the**
 13 **objective detection threshold methodology in the Shevrin lab⁵**

14 In SDT, a parameter is calculated which indicates the so-called detectability of the stimulus or
 15 sensitivity named d' (*d prime*). To calculate d' , one needs to know a person’s hit (H) and false
 16 alarm (FA) rates (see Figure 18.3).

17 d' then is the standardized difference between the means of the false alarms (FA) and hits (H)
 18 distributions: $d' = z(\text{FA}) - z(\text{H})$.⁶ Larger absolute values of d' mean that a person is more sensitive to

⁵ The ‘Shevrin lab’ is actually the Ormond and Hazel Hunt ERP Laboratory at the University of Michigan. It has been in existence since 1980 and is part of the University of Michigan Program of Research on Unconscious Processes, which is considered one of the leading programmes devoted to investigating unconscious processes. The Michigan programme was preceded by a loosely organized group of investigators both at the Menninger Foundation where the research began and at the University of Michigan. Throughout this time the programme has been directed by Howard Shevrin, an experimental psychologist and psychoanalyst. The research programme has two programmatic goals: (1) to establish the existence and nature of unconscious processes, and (2) to investigate qualitative differences between conscious and unconscious processes related to the psychoanalytic distinction between primary and secondary processes. Throughout this chapter, references are made to individual publications emerging from the programme. The authors of these studies aside from Shevrin have been Michael Snodgrass, Linda Brakel, Edward Bernat, Philip Wong, Scott Bunce, Ramesh Kushwaha, William Williams, Robert Marshall, Ariane Bazan, Samuel Winer, Richard Hertel, and James Bond.

⁶ Thus, $z(\text{FA})$ and $z(\text{H})$ are the z scores that correspond to the right-tail p -values represented by FA and H. For example, a false alarm rate of 0.30 indicates that when the signal is absent the subject nevertheless says ‘yes’ 30% of the time. Thus, the right-tail p value on the ‘signal absent’ distribution is 0.30 and a p value of 0.30 corresponds with a z value of 0.524 (see p to z conversion tables). A hit rate of 0.90 indicates that when



1 the difference between the signal present and signal absent (or ‘noise’) distributions. In subliminal
 2 priming, it is crucial that the d' of the direct task for the conscious perception is not significantly
 3 different from zero, that is, the subject cannot make a distinction between signal and noise, resulting
 4 in an at-chance performance.

5 For different direct tasks, such as, for example detection, identification, and categorization,
 6 subjects will have different d' values.⁷ Importantly, presentation times corresponding to a d' not
 7 significantly different from zero for a categorization task will yield a slightly positive d' for an
 8 identification task at the same presentation conditions. Similarly, at conditions a bit more strin-
 9 gent (e.g. shorter presentation times) where d' for identification now becomes equivalent to zero,
 10 d' for detection will still be slightly positive. Concretely, this means that at presentation times
 11 where conscious categorization is at chance, conscious identification is slightly above chance.
 12 Similarly, at conditions where conscious identification is at chance, detection is slightly above
 13 chance. Now, it is important to indicate that for all subliminal priming studies, discussed so far,
 14 either subjective threshold methodology was used, or if objective measures were used, then the
 15 direct CPI task was never as stringent as a detection task, mostly being an identification or catego-
 16 rization task. However, together with the psychoanalyst Shevrin, the second author has developed
 17 a model called the *objective threshold/strategic model*, which holds that conscious perceptual influ-
 18 ences typically override unconscious ones on the experimental task when both are present
 19 (Snodgrass and Shevrin, 2006; Snodgrass et al., 2004). Consequently, unconscious perceptual
 20 effects are obtained most reliably only when conscious perception is *completely absent*, that is,
 21 when measured at the very stringent presentation conditions of the *objective detection threshold*
 22 *where detection d' is not significantly different from 0*.⁸ This model holds that *in those conditions*
 23 *objective threshold effects are genuine and not short lived*.

24 Using this stringent methodology, Shevrin and colleagues have accumulated a body of subliminal
 25 priming results. While most research teams shy away from ultra-brief presentation times, fearing
 26 nothing at all will be processed, Shevrin and colleagues have shown that these kind of subliminal
 27 stimuli elicit ERP patterns that are structured similarly to ERP patterns evoked by supraliminal
 28 stimuli at all electrodes, be it at a lesser amplitude (Bernat et al., 2001a,b; Shevrin, 1973; Shevrin

the signal is present the subject only says ‘yes’ 90% of the time. Thus, the right-tail p value on the ‘signal present’ distribution is 0.90 and a p value of 0.90 corresponds with a z value of -1.282 . The d' in this case will be $0.524 - (-1.282) = 1.81$.

⁷ Take, for example, the two words: ‘rose’ and ‘fighting’. Subliminal presentation of these words can be subject to different forced-choice tasks. In a *detection task* the subject will simply be asked if either a stimulus (‘something’) or a blank card (‘nothing’) was shown to him, knowing that half of the trials are stimulus cards and half of them are blank cards and that they are randomly distributed. In an *identification task* the subject will be asked to tell which of the two words (known to the subject) is presented. In a *categorization task* the subject will be asked to judge, for example, the emotional valence (positive or negative) on each subliminal presentation. In detection hits and false alarms are straightforward: a hit is when a stimulus is rightly detected and a false alarm is when the participant indicates the presence of a stimulus while a blank card was presented (see Figure 8.3). In identification a hit is when the participant says ‘rose’ when ‘rose’ is presented, and a false alarm is responding ‘rose’ when ‘fighting’ is presented. Note that the same d' will be obtained if d' is calculated the other way around (e.g. defining hits as responding ‘fighting’ when ‘fighting’ is presented). In categorization a hit is when ‘positive’ is responded when ‘rose’ is presented, and a false alarm is responding ‘positive’ when ‘fighting’ is presented. Again, the same d' will be obtained if d' is calculated the other way around.

⁸ Concretely, these very stringent conditions are realized either by using a tachistoscope and presenting stimuli at one millisecond, followed by an energy mask, or by using a cathode ray tube display and presenting stimuli at 7 milliseconds (lower boundary for the refresh rate), followed by a pattern mask.





1 and Fritzer, 1968). Moreover, *subliminal semantic priming* was shown in a study by Klein Villa and
2 colleagues (2006). In this study a subliminal prime, presented in the tachistoscope at 1 ms, such
3 as ‘dog’ was able to prime the preferential choice of the supraliminal target ‘canine’ as compared
4 to the distracter target. However, this effect was not found as a main effect, that is, it was not
5 found as an effect or tendency over the whole group of participants. Instead, it was found as *an*
6 *interaction effect with personality factors*. Indeed, in agreement with psychoanalytic metapsychology,
7 it was presumed that unconscious processes would vary—that is, have other dynamic principles—
8 in function of personality structure, especially in function of the defensive mode. For this reason,
9 a variety of personality factors are measured routinely in each subliminal priming study done at
10 the Shevrin lab, including defensivity (operationalized as ‘social desirability’; Crowne and
11 Marlowe, 1960), mode of defence (measured by the ‘hysteroïd obsessoid quotient’ or HOQ;
12 Caine and Hope, 1967), and anxiety. In the Klein Villa study, it was found that participants with
13 high trait anxiety showed facilitation for semantic priming. Remarkably, participants with low
14 trait anxiety did not show an absence of semantic priming, but an *inhibition*, meaning that they
15 chose the distracter at higher levels than chance. Remarkably, it was also shown that ‘dog’, which
16 is the reverse word of ‘god’, was able to prime for ‘angel’ in high anxious people, while in low
17 anxious people the palindrome choice was significantly avoided (i.e. the semantic associate of the
18 palindrome was chosen significantly *less than chance*). In the supraliminal control experiment,
19 primes shown fully consciously were able to prime for the ‘forward’ semantic target but *not* for
20 the palindrome semantic target. An important aspect of the Klein Villa et al. results was that the
21 reported interaction effects were even stronger when stimulus detectability was low than at higher
22 levels of detectability. This not only rules out any sceptical account that the measured effects
23 might be due to residual conscious perception, but moreover, it is in agreement with the Snodgrass
24 and Shevrin model, which proposes that any residual conscious perception reduces rather than
25 enhances the unconscious effects.

26 Inhibition effects, that is, *results significantly below chance*, have been repeatedly found by
27 Shevrin and colleagues, starting with the 1993 paper by Snodgrass and colleagues. In this study,
28 participants were asked to do an identification task (i.e. the UPI) while subliminality was verified
29 by a detection task (i.e. the CPI). One of four words, known to the participants, was presented at
30 1 ms and the participant had to identify which of the four words was presented. The detection d'
31 in the experiments of this study (as in the later replications) was not significantly different from
32 zero. Overall identification by the participants was not significantly different from chance, that is,
33 there ~~were~~ no main identification effect. However, participants were asked to use one of two
34 strategies in order to identify the stimuli: in the *look* strategy, subjects were instructed to attend
35 carefully to the visual field and look hard for any trace of the stimuli; in the *pop* strategy, subjects
36 were urged to allow one of the four stimulus words to pop into their heads—to say whichever of
37 the four words comes to mind. Following the completion of the two strategy conditions, subjects
38 were asked which of the two conditions they preferred. The 1993 experiment was replicated both
39 in the Shevrin lab (Snodgrass and Shevrin, 2006) and by Van Selst and Merikle (1993). The main
40 consistent finding in the original experiment and in its replications (see Table 18.1), then, was
41 that ‘poppers’ facilitated slightly in the pop condition ($p = 0.035$), while ‘lookers’ did better than
42 chance in the look condition ($p = 0.000114$) and performed *significantly below chance* in the pop
43 condition ($p = 2.98 \times 10^{-7}$; p values of the meta-analysis, Snodgrass and Shevrin, 2006).

44 Most importantly, this looker inhibition result correlated again *negatively* with stimulus
45 detectability: that is, the lower the d' , the more the lookers performed below chance in the pop
46 condition. Taken together, these data showed that the subliminal inhibition effect is very robust.
47 The only way to understand this result then, is that ‘when utilizing the strategy congruent with
48 their preference, perhaps participants unconsciously allow this activation to influence their



**Table 18.1** Meta-analysis of the pooled data of the ‘pop-look’ experiments

Preference	Strategy	
	Pop	Look
Pop (<i>n</i> = 139)	25.74 (4.12)	24.71 (4.55)
Look (<i>n</i> = 105)	23.06 (3.64)	26.40 (3.59)

Standard deviations and *ns* are in parentheses. Mean performance is percentage correct (chance = 25). See text for significance levels.

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1 response, elevating performance above chance. In contrast, when utilizing the incongruent strategy,
 2 such influences are *unconsciously rejected* and below-chance performance ensues’ (Snodgrass and
 3 Shevrin, 2006, p. 63, original emphasis). The looker inhibition then ‘might reflect a simple form
 4 of *unconscious defense*, . . . Along these lines, lookers consistently expressed a strong preference for
 5 activity and control, explaining that they disliked “doing nothing” as the pop instructions
 6 required. Obliging lookers to relinquish conscious control with pop instructions might instantiate
 7 a mildly conflictual situation, producing inhibition, whereas more congenial look instructions
 8 would not, yielding facilitation’ (Snodgrass and Shevrin, 2006, p. 63). In other words, it seems
 9 quite impossible to make sense of these results without assuming the existence of unconscious
 10 inhibition, the dynamics of which (only) seems to make sense in a psychodynamic interpretation.

11 Going back to the Klein Villa study, how can we then make sense of the unconscious avoidance
 12 of semantic associates at low levels of trait anxiety? We propose that this semantic and phonological
 13 associativity reflects a primary process dynamical organization that is thought to be under inhibitory
 14 control of the secondary process such as described by Freud (1895, 1900; see also Bazan, 2006).
 15 Uncontrolled free association constitutes a threat because it may lead to the revelation of uncom-
 16 fortable subjective truths such as in parapraxes, dreams, or during free association. Therefore, a
 17 ‘good’ defensive organization may imply an effective inhibition of this association. Anxiety inter-
 18 feres with the organization of defence; therefore people with structurally higher levels of anxiety
 19 might not be able to defend as efficiently and show associative facilitation, explaining the present
 20 results. Alternatively, it might also be that people, who on a paper-and-pen questionnaire claim
 21 to be usually less anxious, are more defensive than people who admit more anxiety experience.
 22 Thus the low anxiety would be an indication of an efficient defensive organization, resulting in
 23 inhibition of association. This seems to be confirmed in the preliminary results of a new study
 24 with phonological palindromes showing inhibition of the phonological palindrome choice in
 25 high defensive participants (Bazan et al., 2008).

26 The Shevrin lab results summarized so far are indicative of an inhibition happening uncon-
 27 sciously and suggestive of a defensive personality style. Another type of inhibition results have
 28 also been found in the Shevrin lab, indicating that presumably repressed material is unconsciously
 29 present but is not used consciously. Together with three colleagues psychoanalysts, Shevrin
 30 undertook a study with participants suffering from social phobia (Shevrin et al., 1996). A number
 31 of psychoanalytic interviews were conducted with each participant, aimed at understanding the
 32 underlying unconscious conflict to the phobia and at selecting words that were related to that
 33 unconscious conflict, as well as words that indicated how participants consciously experienced
 34 their symptom. These words, together with control words, were then presented both subliminally
 35 and supraliminally to the participants and ERPs were collected. In other words, a particular set of
 36 prime words was constituted for each participant. The main results, then, were that when the





1 unconscious conflict words were presented subliminally (at 1 ms) the brain waves of those words
2 could be classified as going together on the basis of common brain ERP features.⁹ Remember,
3 these words were *inferred* by the analysts from the conscious story brought by the participants; they
4 were at no point indicated as such by these participants, let alone indicated by them as pertaining
5 to the conflict underlying their symptoms. The brain waves related to the conscious symptom
6 words did not show common features. On the other hand, when the same words were presented
7 supraliminally, the brain waves no longer put the unconscious conflict words together but they
8 did a better job of putting the conscious symptom words together. Moreover, the experimental
9 effect correlated highly with HOQ repressiveness: the more repressive, the better the brain waves
10 put the unconscious conflict words together subliminally than supraliminally. To interpret these
11 results, Shevrin and colleagues suggest that when the unconscious conflict words are presented
12 consciously, there is a repressive inhibitory process at work which keeps the subject's brain and
13 conscious awareness from seeing any relationship among these words, and this all the more with
14 higher repressiveness (Shevrin et al., 1992).

15 In conclusion, we propose that working at the stringent conditions of the objective *detection*
16 threshold for subliminal priming does make a difference. The idea is that only in these conditions
17 one is able to uncover the deep unconscious inhibition and defensive characteristics of the
18 Freudian unconscious. In their taxonomy, Dehaene and colleagues (2006,¹⁰) define *subliminal*
19 *processing* as a condition of information inaccessibility where bottom-up activation is insufficient
20 to trigger a large-scale reverberating state in a global network of neurons and is therefore insuf-
21 ficient to realise conscious access. While subliminal processing is defined as unreportable and
22 unaccessible, Dehaene and colleagues (2006) and others (Greenwald et al., 2003; Kunde et al.,
23 2003) report that, contrary to what was thought previously, conscious indications or task instruc-
24 tions, are able to strategically influence this processing. We propose, however, that this kind of
25 subliminal processing still reflects weak conscious processing characterized by unreportability
26 and unaccessibility and corresponding to the 'phenomenally conscious' (cf. Block, 2005, 2007;
27 Snodgrass and Lepisto, 2007; Snodgrass et al., 2009). We propose that there is a different form of
28 subliminal processing which we would call (*deep*) *unconscious* processing, which is also character-
29 ized by unreportability and unaccessibility, but the dynamics of which are moreover not sensitive to
30 conscious strategic instructions in a straightforward manner but are structurally sensitive to subject
31 factors, which are primarily related to the subject's defensive organization, such as trait anxiety
32 and defensivity. Characteristic for this kind of deep unconscious processes is that they behave
33 differently in different subjects; this implies that there are seldom main effects to be observed
34 experimentally in subliminal priming at the objective detection threshold, but that the uncon-
35 scious effects are uncovered when personality structure information is taken into account. In this
36 framework, implicit information processing as described in neuropsychological case studies or,
37 for example, in blindsight (see 'Other search results' below), are considered as subjective threshold
38 phenomena (Snodgrass and Shevrin, 2006) at the level of the phenomenally conscious and

⁹ These are time-frequency features: an ERP is a time series of brain response to stimuli measured on the scalp; 'fast Fourier spectrum' transformation converts a time series into a frequency domain data that depicts energy or power at each frequency. A time-frequency distribution provides a view of power for each time and frequency bin.

¹⁰ Dehaene and colleagues (2006) propose a difference between preconscious and unattended and attended subliminal processing, all three being characterised by unreportability. The *preconscious* is defined, referring to Freud, as a neural process that potentially carries enough activation for conscious access, but is temporarily buffered in a nonconscious store because of a lack of top-down attentional amplification; stimuli are potentially accessible but are not consciously accessed.





1 characterized by unreportability. The uncovered defensive mechanisms, although proper to the
2 neuropsychological condition, are not sensitive to personality factors, and might therefore be of a
3 different kind than the unconscious inhibition mechanisms observed at the objective detection
4 threshold.

5 **Unconscious inhibition of motor control**

6 **Intention to move**

7 Since the seminal work of Libet and colleagues (Libet, 1985; Libet et al., 1983) it is known that the
8 readiness potential (RP), a gradual increase in electrical activity in the motor cortex that precedes
9 willed actions by one second or more, precedes the moment at which subjects first become aware
10 of their will to move by 200–500 ms. In other words, a person's conscious experience of intending
11 to act *follows* the RP. A network of cortical regions within the dorsal medial frontal cortex has
12 been identified as the neural substrate in the voluntary control of intentional actions (Passingham,
13 1993). In particular, the supplementary motor area (SMA), supplementary eye field (SEF), and
14 the pre-SMA have been implicated in the control of actions that are self-initiated or driven by
15 internal goals (e.g. Isoda and Hikosaka, 2007; Lau et al., 2004; Nachev et al., 2005; Tanji and
16 Shima, 1994). Hallett proposed (2007) that movement is initiated in frontal lobe on the basis of
17 its several (prefrontal and limbic) inputs.¹¹ The movement command goes to the primary motor
18 cortex with an efference copy to the parietal area and the conscious sense of volition most likely
19 arises as the result of this efference copy (Hallett, 2007). In other words, the motor system generates
20 a movement and, in parallel, signals are generated which produce the subjective experience of
21 willing to execute that action, which is perceived as being freely chosen. Libet (1985) indicates
22 that while actions appear not to be freely initiated, they may be freely stopped. Indeed, because
23 awareness of intention precedes movements by some hundred milliseconds, there is still time to
24 consciously withhold the upcoming action. This veto power, or 'free won't' would therefore be
25 the basis of our freedom to choose our actions. Brass and Haggard (2007) show that it is a specific
26 area different from the SMA or pre-SMA, namely the left dorsal fronto-median cortex (Brodmann's
27 area 9), which is specifically associated with this conscious suppression of self-initiated actions.

28 **Conscious experience of the will to move**

29 However, perhaps it is not the intention to move as such which generates the *conscious experience of*
30 *the will to move*. Haggard and Eimer (1999) showed that awareness of intention correlates better
31 with a later component of the RP, the lateralized readiness potential (LRP). LRP reflects the electrical
32 activity over the motor cortex opposite to the limb that will move. Since the motor system must have
33 selected which specific movement to perform by the time that the readiness potential lateralizes,
34 Haggard and Eimer (1999) proposed that awareness of movement may arise from neural processes
35 linked to the *selection* of an action to pursue a given goal and not to the earliest initiation of action
36 processes.

37 This makes sense: as indicated by Sumner and colleagues (2007), a defining criterion for voluntary
38 behaviour is that the stimulus environment does not inevitably specify one particular movement.
39 In other words, there is choice and therefore contingency, because more than one action may be

¹¹ Recently, it was shown that a network of high-level control areas begin to shape an upcoming decision long before it enters awareness (Soon et al., 2008): the earliest unconscious precursors of the motor decision presumably originate in frontopolar cortex, from where they influence the build up of decision-related information in the precuneus and later in SMA, where it remains unconscious for up to a few seconds. More precisely, it was found that the outcome of a decision can be encoded in brain activity of prefrontal and parietal cortex *up to 10 seconds* before it enters awareness.





1 associated with the current conditions. Voluntary behaviour thus implies a potential for coactivation
2 of action plans (Nachev et al., 2007). Therefore it has been widely accepted that some form of
3 motor inhibition is at play for action selection. This has been shown for the LRP in subliminal
4 motor priming experiments. Indeed, parallel to what was discussed earlier on the unconscious
5 inhibition of mental representations, a wealth of results have also been obtained in the domain of
6 subliminal motor priming. These subliminal priming paradigms (e.g. Eimer and Schlaghecken,
7 1998) typically present primes—mostly arrows pointing to the right or to the left—for 16 ms,
8 followed by a 100 ms mask; targets are again arrows pointing in the same or in the opposite direction;
9 participants typically are asked to make key-press responses with their left or right hand depending
10 on the side pointed to by the arrow in the target. Forced choice discrimination tasks on the primes
11 show random identification performance, confirming their subliminal status. The results show
12 that the subliminal primes initially activate a motor response, inducing positive priming for com-
13 patible trials. However, at longer SOAs (stimulus onset asynchrony), this activation is followed
14 by an inhibition, inducing negative priming on compatible trials (this is the so-called ‘negative
15 compatibility effect’ or NCE; Eimer and Schlaghecken, 1998), that is, due to the inhibition of the
16 specific movement (the same in prime and target) reacting upon the target is delayed. Depending
17 on the authors, this inhibition is considered as either a spontaneous inhibition of reactions
18 induced by subliminal stimuli if these stimuli remain unconfirmed by stronger information or if
19 they suddenly stop (self-inhibition hypothesis; Boy and Sumner, 2010; Schlaghecken and Eimer,
20 2002) or as an inhibition due to new competing information brought by the mask or by flankers
21 (Boy et al., 2008; Jaśkowski, 2007, 2008). Most accounts agree on the existence of mutual inhibi-
22 tory connections between response alternatives (see Sumner et al., 2007). Praamstra and Seiss
23 (2005) proposed that alternating cycles of activation and inhibition are inherent in the competi-
24 tive interactions between response alternatives, perhaps due to a mechanism that detects and
25 opposes large activation differences. Moreover, Sumner et al. (2007) demonstrated that the SEF
26 and the SMA are critically involved in this unconscious suppression of unwanted responses
27 elicited by the surrounding context. It is this unconscious inhibition process then which realizes
28 the selection of an adapted movement in function of the environment. Paradoxically, this uncon-
29 scious inhibition might then eventually yield the first conscious awareness of the will to act, perceived
30 as free will. This conclusion is coherent with Jeannerod (1994), who proposed that it is precisely
31 the inhibition of action which renders its imagery conscious, while without inhibition an action
32 preparation comes to execution without the need for conscious intervention.

33 Among the multiple triggers for movement (see also Bargh and Morsella, 2008), action-related
34 *objects* can activate multiple action plans in parallel: indeed, findings suggest that ambient stimuli
35 automatically set us to physically interact with the world (e.g. perform a power grip, Tucker and
36 Ellis, 2001). Moreover, the physical behaviour (posture, facial gestures, arm and hand move-
37 ments) of *people* elicits others to behave in the same way, without them intending to or being
38 aware they are doing so. Bargh and Morsella (2008) add that this unconscious imitation also
39 tends to increase bonding between individuals, serving as a kind of natural ‘social glue’.
40 Furthermore, at a more complex level of behaviour, research has also demonstrated effects of
41 subliminal stimulation on goal pursuit. Recently, indeed, Custers and Aarts have summarized a
42 wealth of results which show that ‘people become motivated to initiate and exhibit behaviours
43 available in their repertoire when goals that are represented as desired outcomes are primed, even
44 though they are not aware of the primed goal or its effect on their motivation and behaviour’
45 (2010, p. 48). For example, results show increased task performance after priming of achievement-
46 related words (Hart and Albarraçín, 2009), enhanced fluid consumption in a taste task after priming
47 of drinking-related words (Strahan et al., 2002), and an increase in instrumental behaviour leading





1 to specific goals (such as helping another person) after priming of names of occupations associated
2 with these goals (such as nurse; Fitzsimons and Bargh, 2003).
3 If flexible behaviour is to be possible, though, such automatic motor activation must be inhibited
4 and free initiative must be mediated by selective disinhibition. In other words, with choice comes
5 the need to inhibit any response activation triggered by the environment which would otherwise
6 interfere with ongoing motor plans. This unconscious inhibition then is different from the
7 *conscious* decision to suppress a movement that was already initiated as indicated higher. Crucially,
8 it is the unconscious inhibition that is thought to enable the conscious experience of the will to
9 move, and thus it is this unconscious inhibition which subsequently enables the possibility of
10 conscious suppression of self-initiated action.

11 **Suppression and inhibition in memory and language processing**

12 The necessity to inhibit competing alternatives in order to achieve directed behaviour turns out
13 to be a general principle of mental functioning. Not only does this principle operate in action
14 selection, but research shows that it is also working both in memory and language processing.

15 In memory research, several studies have shown that the act of recall reduces access to related
16 memories, a phenomenon known as ‘retrieval-induced forgetting’ (e.g. Anderson et al., 1994,
17 2000; Bjork et al., 1998). Anderson and colleagues show that this forgetting is caused by inhibitory
18 processes inherent to recall: an attentional inhibition process suppresses competing items in order
19 to focus the search for retrieval targets (Anderson and Spellman, 1995; Anderson et al., 1994;
20 Johnson and Anderson, 2004). Anderson and Bell (2001) show that the consequence can be an
21 enduring impairment for the interfering facts, which may generalize to associated facts (see also
22 Anderson and Spellman, 1995). When people regularly use some of the facts about a topic selec-
23 tively, they risk more rapidly forgetting related facts that go unused. Furthermore, Anderson and
24 Green (2001) show that when people encounter cues that remind them of an unwanted memory
25 and they consistently try to prevent awareness of it, the later recall of the rejected memory becomes
26 more difficult. The forgetting is caused by processes that suppress the memory itself and this sup-
27 pression has enduring consequences. Anderson and colleagues (2004) show that controlling
28 unwanted memories is associated with increased dorsolateral prefrontal activation and reduced
29 hippocampal activation. Recently, Depue and colleagues (2007) have shown that emotional
30 memories are initially suppressed by the right inferior frontal gyrus, followed by the right medial
31 frontal gyrus over regions supporting sensory (visual cortex, thalamus), respectively emotional
32 components of the memory representation (hippocampus, amygdala). Interestingly, the authors
33 mention that their data ‘also provide an intriguing hint that, as suggested in clinical practice, it is
34 necessary to “revisit” an emotionally distressing memory before it can be controlled; p. 218’.

35 In language research, it has been known since longer that normal language processing requires
36 an online *structural* inhibitory intervention. Not only do homonyms—that is, words with multiple
37 meanings such as ‘match’—exhaustively activate all meanings present in memory for a very short
38 period of about 100 ms (e.g. Onifer and Swinney, 1981; Seidenberg et al., 1982; Swinney, 1979)
39 but moreover, because there are no pauses between words, language is polysemic in nature, inde-
40 pendently of the presence of homonyms. For example, Cutler and colleagues (2002) indicate that
41 an apparently unambiguous phrase such as ‘We stop begging’ transiently activates the meanings
42 of the intermediary words ‘east’ between ‘We’ and ‘stop’ and ‘egg’ in ‘begging’. This activation is
43 so transient that we do not become conscious of it. Before 100 ms (about three syllables) have
44 elapsed an active, energy-costing inhibition process intervenes which inhibits all non-contextual
45 meanings (Faust and Gernsbacher, 1996; Gernsbacher and Faust, 1991; Gernsbacher and Robertson,
46 1995; Gorfein et al., 2000; Paul et al., 1992; Simpson and Kang, 1994). Interestingly, it is by the





1 *spill-over* of this inhibition that we may have a hint of its existence. For example, Gernsbacher and
2 Robertson (1995) show that if a phrase ending in a polysemic word used in one of its meanings
3 such as 'He lit the *match*.' is immediately followed by a phrase using that same polysemic word in
4 another meaning (e.g. 'He won the *match*.') a measurable delay of comprehension is observed.
5 Indeed, for a correct disambiguation of the sentence, the first encounter of 'match' has induced
6 an inhibition of its non-contextual alternative meanings, which has not yet completely recovered
7 to baseline when arrives the second sentence. This second sentence however needs the previously
8 inhibited meaning for a correct understanding, thereby causing a slight delay in comprehension.
9 Moreover, it has been shown that this inhibitory effect for the subordinate meanings is exercised
10 by the left prefrontal cortex (Atchley et al., 1999; Burgess and Simpson, 1988; Chiarello, 1985).

11 In conclusion, although inhibition in memory and language are still controversial issues, these
12 recent studies suggest that inhibitory processes can be experimentally studied and their neural
13 correlates are beginning to be specified. While the memory results pertain to conscious retrieval and
14 associated suppression processes, the language results pertain to unconscious multiple activation
15 and associated inhibition processes. However, the patterns for action, memory, and language are
16 the same: multiple activation brings about the need to eliminate competing alternatives and it is
17 this elimination of alternatives which results in the selected response to acquire a consciousness
18 advantage.

19 Other research results

20 Besides the subliminal priming research, a number of other experimental approaches have yielded
21 results pertaining to unconscious defensive processes, including hypnosis research enabling brain
22 imagery and investigating inhibition in hysterical conversion (Raz and Wolfson (Chapter 19) and
23 Oakley (Chapter 20), this volume) and neuropsychological case studies of brain lesion patients
24 with various syndromes. For example a number of studies have demonstrated that patients with
25 deficits in certain conscious processes, such as episodic memory, perception, or self-awareness,
26 may nevertheless be able to implicitly process such information. For example, implicit processing
27 has been demonstrated in hemispatial neglect (Marshall and Halligan, 1988), blindsight (Weiskrantz
28 et al., 1974), prosopagnosia (Tranel and Damasio, 1985), amnesia (Johnson et al., 1985), and more
29 recently anosognosia (e.g. Fotopoulou, 2010; Ramachandran, 1995, 1998) or somatoparaphrenia
30 (e.g. Morin et al., 2005). Furthermore, in some of these syndromes the lack of conscious processing
31 seems to be actively maintained by the existence of organized defensive behaviours along the lines
32 described by Freud (cf. Fotopoulou, 2008; 2010; Fotopoulou and Conway, 2004; Fotopoulou et al.,
33 2010; Morin et al., 2005; Nardone et al., 2007; Ramachandran, 1994).

34 Speculations on the physiology of repression

35 Consciously and unconsciously induced repression

36 Anderson and Green (2001) and Conway (2001) have defended the idea that the induced forgetting
37 findings provide a viable neurobiological model of repression understood as the forgetting of
38 unwanted memories by pushing them away into the unconscious. This, they claim, lends support to
39 Freud's original definition of repression: it shows the existence of consciously initiated, executive
40 inhibition of memory. There is a common element in the inhibition processes described for
41 memory, action, and language and which is well known to clinicians, namely the so-called 'spill-over'
42 of the inhibition. Inhibition betrays itself through being *too* efficient and including associated ele-
43 ments which were not a target in the first place. In the memory research, avoiding unwanted
44 memories is reported to induce forgetting of associated elements. For action selection, Sumner et al.



1 propose: ‘On occasions, such automatic [inhibition] mechanisms might appear maladaptive, sup-
 2 pressing actions that are subsequently required’ (2007, p. 699). This is dynamically similar to the
 3 ‘match’ example cited higher in language processing. Compare these instances to the forgetting of
 4 *Signorelli* by Freud (1901): this forgetting, he explains, is due to the spill-over of the inhibition
 5 imposed by him on the phrase ‘*Herr, was ist da zu zagen*’ (‘Sir, what can I say’) a fragment of a
 6 memory on the sexual mores of the Turks which came to his mind but which he pushed away
 7 because it was not a decent topic of conversation. While pushing away ‘*Herr*’, Freud also pushed
 8 away its close associates, such as the Italian translation of this word, ‘*Signor*’ and its compounds,
 9 among which ‘*Signorelli*’. In this sense, the model proposed by Anderson and Conway illustrates
 10 a process which corresponds dynamically to the Freudian model of repression.

11 Nevertheless, these induced forgetting findings concern a *consciously initiated* inhibition of
 12 memory. It appears problematic to limit the concept of repression to a consciously initiated process:
 13 this is not what is proposed in Freud’s original metapsychology (see section ‘Metapsychology of
 14 Freudian repression’ above; cf. Erdelyi, 2006 for a discussion of this point), and it is also not in
 15 accord with clinical observation. Again, the forgetting of the name ‘*Signorelli*’ is a good illustration
 16 of this point (Freud, 1901, pp. 2–7). Instead of the name ‘*Signorelli*’ two substitutes actually came
 17 to Freud’s mind, ‘*Boticelli*’ and ‘*Boltraffio*’. For ‘*Boticelli*’ it seems that it is composed by the original
 18 ending -elli upon which no repression was exercised, and the first part ‘*Bo*’, which by being meto-
 19 nymically associated to the compound ‘*Bosnia—Herzegovina*’, refers to the defensively targeted
 20 syllable ‘*Herr*’. The substitute ‘*Boticelli*’ then is the return-of-the-repressed substitute of a
 21 *conscious* instance of suppression since Freud remembered very well that he purposely pushed
 22 away an anecdote starting with ‘*Herr, was ist da zu zagen . . .*’. However, the substitute ‘*Boltraffio*’
 23 seems metonymically associated to ‘*Trafoi*’, a city in Herzegovina, where a patient of Freud, des-
 24 perate due to an incurable sexual dysfunction, had recently killed himself. Freud had no memory
 25 whatsoever of this patient having crossed his mind during the conversation, even if it would have
 26 been logical given the similarity in themes, namely death and sex. However, given the closeness of
 27 the syllables ‘-traffio’ and ‘*Trafoi*’, Freud then had to assume, that is, to reconstruct, that this
 28 painful event must have nevertheless been mentally present but that it was inhibited and created
 29 the return-of-the-repressed substitute of an *unconscious* instance of repression, ‘*Boltraffio*’.
 30 Similarly, during the course of a clinical journey, a subject comes to encounter both insights of
 31 which he might say: ‘I knew it all along’ and conjectures he has to assume in order to make sense
 32 of his own behaviour but which seem alien to him, as if they originated from ‘*den anderen*
 33 *Schauplatz*’, from a strange place.¹² For these last instances the blocked access to these insights was
 34 probably not consciously initiated. In this context it seems very interesting that the Shevrin lab
 35 research shows at least two kinds of experimental results: in some studies, behavioural and brain
 36 results demonstrate that there is a knowledge which is not consciously used but is nevertheless
 37 present unconsciously (and physiologically; e.g. Shevrin et al., 1992, 1996) and another series of
 38 results indicates inhibition at an unconscious level, where access to potential information is
 39 *unconsciously* (and physiologically)¹³ *avoided* (e.g. Klein Villa et al., 2007; Snodgrass et al., 1993).
 40 In this respect, it must be stressed that the language and action research cited above uncovers a
 41 process of ambiguity resolution which takes place *before* awareness of the initiative arises: the
 42 inhibition is initiated unconsciously and there is no conscious access to the activated contents
 43 which are not selected for execution. Moreover, interestingly, for action and language, there are
 44 strong suggestions that it is the selection process itself which is constitutive of the becoming aware.

12 cf. the famous ‘*ça parle*’ (‘id/it speaks’) of Lacan (1964).

13 Preliminary results of Bazan et al. (2008b).



- 1 This is markedly different from the induced forgetting results describing a conscious intention of
 2 pushing away of the unwanted memory which has first come to consciousness.

3 **Indications of reality versus efference copies**

4 How, then, can we think of the described inhibitory selection mechanism at a physiological level?
 5 In the metapsychological introduction we have seen how Freud puts language and action on a
 6 same level in the mental apparatus: ‘A presentation which is not put into words, or a psychical act
 7 which is not hypercathected, remains thereafter in the Ucs.’ (Freud, 1915b, p. 186). This is important
 8 because we propose that Freud’s model can be most productively read in a sensorimotor perspec-
 9 tive. In Freud’s most neurological account on repression—in his ‘Project for a scientific psychology’
 10 (1895)—he described two fundamental modes of mental treatment: the primary process and the
 11 secondary process. While the primary process will treat all incoming stimuli (both entering from
 12 the environment and from the body) as probes activating associated action plans, the secondary
 13 process will inhibit execution of these action plans, unless a reality check releases this inhibition.
 14 The reality check is realized by what Freud called the ‘indications of reality’ and which he charac-
 15 terized neuro-anatomically: ‘In the case of every external perception a qualitative excitation
 16 occurs in ω . . . [this] ω excitation leads to ω discharge, and information of this, as of every dis-
 17 charge, reaches Ψ ’ (Freud, 1895, p. 325). In this definition, ω neurons are a system of motor
 18 neurons which are engaged in the constitution of perception—thus, you could think of them as
 19 oculomotor neurons, for example—and Ψ is a system of cortical neurons with memory capacity
 20 responsible for psychical processes in general (Freud, 1895). Freud adds: ‘The information of this
 21 discharge from ω is thus the indication of quality or of reality for Ψ ’ (1895, p. 325). Since infor-
 22 mation of the ω discharges is only produced when there is active perception mobilizing the ω
 23 neurons—for example when there is scanning motor activity in the case of vision—this information
 24 then furnishes a criterion to distinguish external perceptions from internal images, that is, it
 25 allows ‘a discrimination between memory and perception’ (Shevrin, 1998, p. 252).¹⁴ For example,
 26 the criterion distinguishes the imagined breast from the perceived breast and only in the latter
 27 case, sucking action is released. We might say that in the case of an imagined breast, the inhibited
 28 sucking action ‘is not hypercathected, remains thereafter in the Ucs.’, that is, we have here a very
 29 basic form of repression.

30 Earlier, the first author has defended the idea that Freud’s ‘indications of reality’ correspond
 31 with the ‘efference copies’ of the modern sensorimotor models (see Bazan, 2007a,b; Bazan, 2008).
 32 Efference copy models (see Figure 18.4) are computational models which propose that upon
 33 motor preparation and intention, copies of the efferent motor information are fed back and used
 34 centrally in an emulation algorithm, which calculates the anticipated somatosensory changes
 35 expected as a consequence of the prescribed motor execution. Upon effective execution, the
 36 actual proprioceptive feedback of that action will then (more or less) balance out the predicted
 37 sensory feedback in the parietal somatosensory cortex (at the level of a so-called ‘comparator’).

38 The modern efference copy models are derived from von Helmholtz’ original model which first
 39 proposed the idea of direct sensation of the motor command: ‘The impulse to move, which we
 40 initiate through the innervation of our motor nerves, is immediately perceptible.’ (von Helmholtz,
 41 1878, p. 123). This idea was later integrated in motor physiology as the ‘corollary discharge’ by
 42 van Holst (1954) and Sperry (1950), and recently reintegrated in the efference copy model in

¹⁴ Shevrin even proposes more generally that ‘The function of consciousness as subjective awareness in any
 state is to distinguish the actual source of a mental content and to reveal the source as a quality or category
 of experience’ (1992, p. 137), these categories referring to mental vehicles such as perception, memory,
 thought, desire, and so on (Shevrin, 1998).



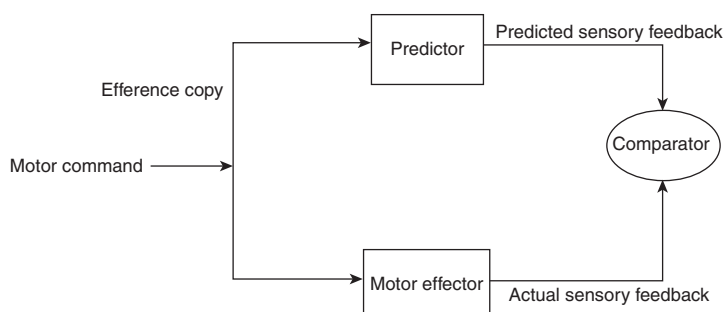


Fig. 18.4 The efference copy model (Blakemore et al., 1998b; Georgieff and Jeannerod, 1998; Sperry, 1950; van Holst, 1954). This computational model proposes that upon motor preparation and intention, copies of the efferent motor information are fed back and used centrally in an emulation algorithm, which calculates the anticipated somatosensory changes expected as a consequence of the prescribed motor execution. Upon effective execution, peripheral changes ~~at the level of the muscles, the joints and the skin~~ generate an actual proprioceptive feedback, which will (more or less) balance out the predicted sensory feedback in the parietal somatosensory cortex (at the level of a so-called ‘comparator’).

1 sensorimotor neurosciences by Blakemore et al. (1998b), Wolpert (1997), Jeannerod (1997),
 2 Frith and colleagues (2000) and others. Freud adhered to the views of the late nineteenth century
 3 physiology school—called ‘physikalischen Physiologie’—of among others, von Helmholtz,
 4 Wundt and Brücke. It is probable that Freud’s model of the mental apparatus was inspired by von
 5 Helmholtz’ insights on the motor control of perception. In *On Aphasia*, for example, Freud
 6 (1891, p. 73) indeed uses the concept of “impression of word innervation” [*Wortinnervationsgefühl*],
 7 next to and different from the ‘kinaesthetic word image’ [*Sprachbewegungsvorstellung*], the sen-
 8 sory impressions from the organs of speech: these ‘innervation impressions’ then logically refer to
 9 von Helmholtz’ concept of immediately perceptible impression to move. In the *Project* Freud
 10 (1895, p. 325) proposes that the ‘indications of reality’ are given by ‘the informations of discharge’,
 11 or, this is to say, literally from Freud’s text, the ‘Abfuhr Nachrichte’, or ‘efference messages’,
 12 which ‘as for every efference message’ flow back to the central nervous system (Freud, 1895,
 13 p. 325). The neuro-anatomical and even semantical closeness of Freud’s concept of ‘indications of
 14 reality’—also called ‘tags’ by Shevrin (1998)—and the modern sensorimotor concept of ‘efference
 15 copies’ then is remarkable. There are also functional equivalences: both the psychodynamic and the
 16 sensorimotor framework propose that these respective instances are characteristic for *conscious*
 17 *processing*. Elsewhere we have defended the idea that both also have the same functional status in
 18 e.g. schizophrenia, enabling the distinction of perceived stimuli from imagined or hallucinated
 19 stimuli (Bazan and Van de Vijver, 2009a,b). In summary, a conceptual equivalence or closeness
 20 between the Freudian notion of ‘indication of reality’ and the modern sensorimotor notion
 21 of ‘efference copy’ is proposed. Note that, earlier, Jeannerod and Georgieff (2000) had already
 22 indicated Freud’s use of a ‘comparator system’ very much comparable with the modern models
 23 for the control of action. These equivalences then will enable us to propose a translation of the
 24 psychodynamic model of repression in physiological sensorimotor terms.

25 A sensorimotor model of repression

26 Moving the scene of the psychodynamic understanding of the mental apparatus to sensorimotor
 27 physiology has many advantages. First, consider Custers and Aarts’s seemingly simple conclusions



1 in their recent review paper: ‘We are able to initiate actions by thinking about their outcomes,
2 because actions and their outcomes are associated on a perceptual, sensory, and motor level. . . .
3 Through prior learning, certain patterns of muscle contraction and relaxation have become
4 associated with their observable outcomes (such as grabbing and lifting a cup). Because of these
5 associations, *bringing to mind the representation* of an outcome prepares and controls perception
6 and action to produce the outcome *without much thought*. . . . *The mere activation of the idea* of a
7 behavioral act or outcome moves and programs the human body *without a conscious decision* to
8 act’ (2010, p. 49, emphasis added). Note Custers and Aarts have no difficulties suggesting that
9 routine mental processing such as ‘bringing to mind the representation’ is supposed to happen
10 ‘without much thought’ nor that the ‘mere activation of the idea’ happens ‘without a conscious
11 decision’. Implicit to these observations is the seemingly unproblematic notion then that ‘repre-
12 sentations’ and ‘ideas’ are not to be considered as a priori conscious; conscious mentation is here
13 regarded as merely one possible option for representations and ideas. This is important, because it
14 puts the sensorimotor and the psychodynamic model at the same starting point: probes from the
15 outer (and inner) world continuously activate (historically) associated action plans unconsciously.
16 Moreover, also implicitly acquired in this paragraph is the constitutive link between representation
17 and action: there is no mental representation apart from, next to, or prior to action plans. Here
18 also, psychodynamic and sensorimotor frameworks are similar (see Freud’s concept of ‘thought
19 as trial action’, Pfeffer, 1998). These views turn around the idea that we first think, independently
20 from action planning, then plan action and finally execute action: rather, psychodynamic and
21 sensorimotor models propose that thinking is only possible as an action, as a motor activity—that
22 is, as a motor planning, intention or simulation—and this thinking is not a priori conscious.

23 To end up with a physiological model of the repression, we now propose to take this reasoning
24 one step further: we propose the idea that mental imagery¹⁵ is not only tied to action, but, crucially,
25 to action inhibition. Bargh and Morsella (2008) have already stressed that inclinations can be
26 behaviourally suppressed, but not mentally suppressed, suggesting that suppressed behaviour is
27 mentally present. But the further idea that inhibited movements are mentally even more influential
28 than perfect movements has also already been proposed by Jeannerod¹⁶ who says: ‘If the goal [of
29 an action plan] were not reached, the sustained discharge would be interpreted centrally as a pure
30 representational activity and give rise to mental imagery’ (1994, p. 201), while an action that
31 reaches its goal does not lead to this imagery. In other words, it is to the extent that an intended
32 movement is not effectively executed, that representational activity arises centrally. One way to
33 understand this ‘mental imagery’ is to consider that the anticipatory simulation of action, brought
34 about by the efference copies, has been shown to induce an anticipatory *attenuation* of its expected
35 sensorimotor consequences at the level of the parietal sensorimotor cortex. The particularity of
36 this dynamical organization is its minute precision: this attenuation is not some global decrease
37 but it is an exact point-by-point subtraction of the expected movement (e.g. Blakemore et al.,
38 1998a), that is, it can almost be considered as a formal ‘negative’ of the movement. When the
39 movement is effectively executed, the preemptive attenuation is resorbed. But, to the precise
40 extent that a movement realisation comes short of exhausting the movement prediction, there is
41 a non-resorbed attenuation rest, that is, a (*negative*) activation rest results at the somatosensory
42 cortex. Moreover, if the movement has encountered unexpected deviations, these will not be
43 attenuated, resulting in a *positive* somatosensory activation. It is precisely these diverse somato-
44 sensory activation results which might be understood then as (yielding) the mental imagery.

¹⁵ The term is here used as the generic term for representations and phantoms, and possibly other species of mental imagery.

¹⁶ And by others, among whom Freud, for whom the thinking mind develops out of frustration.



1 Speculatively, the negative activation rest has formal characteristics (it specifies a non-realized
2 movement fragment) while the positive somatosensory activation rest might correspond with a
3 selective disinhibition of semantic fields as a result of an encounter with the stimulus (see also
4 Bazan and Van de Vijver, 2009b). Complexifying this organization of selective disinhibition (see
5 e.g. Praamstra and Seiss, 2005), might yield a minute system of targeted associative activation
6 responding selectively to the unpredicted encounters of the subject moving in the world.

7 To understand the potential *psychodynamic* significance of this organization, the memory and
8 emotion aspects of this organization have to be taken into account. The first moment of action or
9 language ambiguity before conscious awareness leads to exhaustive activation, that is, to the
10 priming of (potentially) all alternatives associated to the stimulus available to the particular subject.
11 Importantly, this first moment is consequential: even if there is an ‘exhaustive’ activation, this does
12 not mean that there is a universal pattern for all subjects. Indeed, the pattern is still determined
13 by the particular way a subject’s history has organized his or her memory. As a consequence, the
14 way in which a subject come to execute a particular action or language fragment might differ only
15 from the way in which another subject comes to execute that *same* action or language fragment
16 by the action or speech alternatives the first subject had to inhibit in order to make this choice. In
17 other words, performing the same behaviour induces a different mental imagery related to motor
18 inhibition as discussed above—that is, a *different mental reality*—in each subject, as well as different
19 spill-over effects potentially readable for others with whom the subject interacts.¹⁷

20 Moreover, the emotional importance of the different action choices must be considered.
21 Indeed, the different activation alternatives are likely also encoded in an *emotional* memory system
22 (cf. LeDoux, 1994). Action or speech fragments with a higher emotional valence might pop up
23 more easily and frequently. As a consequence—and particularly in case their effective execution
24 might lead to threateningly high emotional mobilisation of the inner body—these instances
25 might necessitate a higher or a more structural level of inhibition. Hence, they are probably
26 particularly inclined to induce mental imagery (which is not necessarily content-related, cf. the
27 concept of ‘phantoms’, Bazan, 2007a) as well as spill-overs or substitutes betraying their presence
28 and importance. Hence, in this model, psychodynamic repression is presented as a special instance
29 of a structural, continuous online mechanism of sensorimotor action inhibition which enables
30 targeted (adequate) action contextually adapted to reality. More particularly, this special instance is
31 induced by action (or speech) alternatives which are prominently present in the mental apparatus and
32 which are tied to an important emotional stirring and which for these reasons, call for more intensive
33 and/or more structural inhibition. It is then the consequences of this exaggerated inhibition—namely,
34 the mental imagery and the spill-over behaviours—which render their psychodynamic characteristics
35 to these special instances of inhibition—namely, mental preoccupation and return-of-the-repressed
36 substitutes. For all these reasons, we propose that the efference-copy-linked attenuation mechanism
37 probably constitutes a key to the physiological understanding of psychodynamic repression.

17 Interacting long enough with an individual subject might therefore create enough opportunities for some such spill-overs to become apparent, informing ‘negatively’ about the unconscious architecture of the subject’s mental apparatus. A common example is the inhibition of an aggressive desire, ‘spilling over’ to inhibition of all or many aggressive impulses, which becomes readable negatively in a patently accommodating and obliging behaviour. This is a content based example (namely, pertaining to aggressive desires), but clinical analysis shows that it also (logically) applies to form-induced dynamics, such as the forgetting of ‘signorelli’ induced by the pushing away of ‘signor’. This comes close to the Lacanian concept of an unconscious as presented in the seminar on ‘The purloined letter’: the unconscious is not some behind-the-scenes hidden place but is continuously realized on stage even if not necessarily recognizable as such—it is realized through the subject’s actions, and most importantly, through his speech (Lacan, 1955).



1 Conclusion and open questions

2 In this review we have presented empirical results pertaining to the issues of defence and (unconscious)
3 inhibition. Our primary aim is to show that this keystone concept of psychoanalysis is not beyond
4 experimental testing and that, in fact, quite a wealth of research results have already accumulated
5 speaking directly or indirectly to this question. Moreover, we propose that a theoretical model
6 involving efference copies/indications of reality as key concepts can coherently put the various
7 findings together. Having done so, a number of questions do remain open.

8 First, an important open question is how the experimental laboratory results pertain to the
9 *clinical* phenomenon of repression. There is probably scepticism both from clinicians to consider
10 the subliminal priming results as clinically relevant and from the cognitive neuroscientist to
11 consider the motor or language inhibition results as having a potential psychodynamic nature. We
12 have taken the deliberate stance to distance ourselves from the notion of repression as an exclusively
13 pathogenic process selectively targeting traumatic content (e.g. Brown et al., 1999; Erdelyi, 2006;
14 Pope et al., 1999). We propose to consider the notions of repression and the unconscious as
15 inseparable and to consider the *dynamic unconscious* as a principle of mental functioning, ‘the
16 true psychic reality’ (Freud, 1900, p. 613). This enables us to discuss repression in the context of
17 action while other authors focus on the forgetting of traumatic memories, making themselves
18 vulnerable to the need to prove such instances of forgetting (e.g. Kihlstrom, 2006; Rofe, 2008).
19 This is not to say that repression is not, in our view, defensive, but the notion of defence is in the
20 first place seen as largely constitutive in enabling humans to make a choice. At the same time, this
21 defence also protects against possibly threatening levels of emotional activation tied to certain
22 alternatives present in memory. In other words, repression enables directed action and ensures a
23 bearable state of mind, at the expense of lost possibilities to attune with reality.

24 This leads us to a second open question: is defence a content-related event or a content-independent
25 subject factor? The Shevrin lab research indicates that defensiveness influences the way the subject
26 processes *all* stimuli. Indeed, repressive subjects respond with smaller visual evoked potentials to
27 subliminal stimuli as well as fewer verbal associations (Shevrin, 1973; Shevrin et al., 1969, 1970)
28 and have a longer critical time period for consciousness to develop for a somatosensory stimulus
29 (Shevrin et al., 2002). Defensiveness also seems at play in how subjects identify stimuli (cf. the
30 ‘pop-look’ study) or handle ambiguity (cf. the Shevrin lab language studies). This opens the possibility
31 that it is the defensive style (see also Erdelyi, 2006) which is pathogenically relevant rather than or
32 next to one or a number of instances of repression.

33 Third, pervading the whole chapter is the question of repression as a consciously initiated process
34 versus resulting from unconscious inhibition. Erdelyi (2006) posits that the difference between
35 conscious and unconscious processing is graded and quantitative and that there is no fundamental
36 difference between unconscious repression and conscious suppression. In this view, the induced
37 forgetting results can stand as a general model of repression. The Libet results uncover the uncon-
38 scious emergence of intentions to act, followed by a period of conscious awareness allowing for
39 conscious veto to intervene. The question of consciously initiated repression versus unconscious
40 inhibition then might be reformulated in the question if conscious instruction is able to influence
41 action selection before awareness of intentionality arises. Kiefer (2007) would probably answer
42 affirmatively to this question. His results show that masked semantic priming is observed when
43 the preceding task set required the orientation to semantic word features, but not when it required
44 orientation to perceptual word features. Therefore, he proposes that unconscious automatic
45 processes are modulated by top-down factors and he suggests the existence of a gating mechanism
46 which orchestrates the conscious and unconscious information processing streams. These results,
47 then, seem to point in the direction of there being no fundamental difference between unconscious



**Box 18.2 Questions for future study/research**

1. To what extent are experimental (laboratory) results on unconscious processes relevant for the clinical situation? To what extent do clinical observations on unconscious phenomena tie into the same fundamental mechanisms observed by scientific laboratory research?
2. Should we consider the psychodynamic notion of repression as a pathogenic process selectively targeting traumatic contents or as a universal principle of mental organization largely enabling normal functioning?
3. Is defence a content-related event or a content-independent subject factor? Is it the defensive style which is pathogenically relevant rather than or next to one or a number of instances of repression?
4. Are there fundamental distinctive differences between conscious suppression and unconscious inhibition?

1 and conscious processing, both being sensitive to conscious instruction and modulation. This
 2 would probably at first sight also fit with the results recently reviewed by Custers and Aarts
 3 (2010). Indeed, these authors indicate that subliminal primes that are specifically related to
 4 rewards can motivate people to increase the effort they invest in behaviours. Overall they show
 5 that there are similar effects of unconscious and conscious rewards on behaviour, concluding
 6 therefore that ‘conscious and unconscious reward cues have similar effects on effort and flexible
 7 cognitive processing’ (Custers and Aarts, 2010, p. 49). However, we propose that these different
 8 conclusions might not be the end of the story. The Shevrin lab results, using the objective detection
 9 threshold methodology, have suggested the existence of (at least) two types of unconscious mental
 10 treatment: in some cases, knowledge is not consciously used but is nevertheless present unconsciously
 11 (and physiologically) and, in other cases, information seems unconsciously avoided. In the latter
 12 case especially, results were only found when the overall priming effects were regressed in function
 13 of (more or less) stable personality factors, especially defensivity and the level of anxiety. This
 14 might be indicative of a mental treatment which is not consciously adjustable in any arbitrarily
 15 chosen direction, but which preferentially responds to more ‘hard-wired’ (though not necessarily
 16 unchangeable) subject factors. In this respect, it is interesting to notice that Custers and Aarts also
 17 implicitly refer to such more ‘hard wired’ influences in the case of their subliminal reward priming
 18 results when they say: ‘This affective-motivational process relies on associations between the
 19 representations of outcomes and positive reward signals *that are shaped by one’s history* (for
 20 example, when a person was happy when making money or performing well). In this case, the
 21 goal is said to preexist as a desired state in the mind’ (2010, p. 49, emphasis added). Therefore, we
 22 suggest that there are probably fundamental distinctions between unconscious inhibition and
 23 conscious repression. Specifically, we propose that the more profoundly unconscious the mental
 24 process, the more it is sensitive to hard-wired, individual differences and the less it is strategically
 25 or arbitrarily adaptable by conscious influences. This, of course, is very much in line with the
 26 psychoanalytic concept of the unconscious.

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