Volition and the readiness potential

Gilberto Gomes

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Current address(2006):
Laboratory of Language and Cognition
UENF, 28013-602 Campos, RJ, Brazil
ggomes@uenf.br

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1. Introduction

The readiness potential was found to precede voluntary acts by about half a second or more (Kornhuber & Deecke, 1965). Kornhuber (1984) discussed the readiness potential in terms of volition, arguing that it is not the manifestation of an attentional processes. Libet discussed it in relation to consciousness and to free will (Libet et al. 1983a; 1983b; Libet, 1985, 1992, 1993). Libet asked the following questions. Are voluntary acts initiated by a conscious decision to act? Are the physiological facts compatible with the belief that free will determines our voluntary acts? What is the role of consciousness in voluntary action? In this paper I will discuss these questions and the answers that Libet gave to them.

Libet conducted experiments in which he tried to determine the timing of the conscious intention to act, in relation to the readiness potential and to the act itself (Libet et al., 1983a, 1983b). His results suggested that the conscious intention to act occurs *after* the beginning of the readiness potential and *before* the neural command that determines the muscular contraction. He also found that a conscious decision could abort the movement, even in the presence of the initial phases of the readiness potential. He concluded that voluntary acts are unconsciously initiated but are subject to conscious control. He proposed that a conscious mental field (that cannot be studied by physical means) causes neural

events in the brain that either promote the culmination in action of the unconsciously initiated process or prevent its progress to action by a veto (Libet, 1993, 1994). So, free will does not initiate the neural process that leads to action but is able to control it.

I have elsewhere made an extensive critical analysis and reinterpretation of Libet's results, both on the timing of conscious sensations and on the timing of conscious intentions (Gomes, 1998b). But, as I will argue later in more detail, I believe we can agree with Libet's conclusion that voluntary acts are nonconsciously initiated. We can also agree that the process leading to action can often be aborted by a conscious veto. However, I will propose alternative views on the bearing of these experiments on free will, on the role of consciousness in voluntary action and on the concepts of conscious intention and conscious control themselves.

2. Voluntary acts, free will and causality

Voluntary acts may be defined as acts that are felt by the subject to have been determined by himself or herself and to have been caused by a conscious decision. This definition depends explicitly on the first-person perspective. From the third-person perspective, one can also regard an act by someone else as voluntary, based on its appearance. In this case, one believes the person in question will also have the feeling that he or she determined the act by a conscious decision. Suppose someone is undergoing a brain surgery, in an awake state. He suddenly raises his arm. Someone who is looking on will probably take this to be a voluntary act, because raising one's arm usually is. But she asks the patient: "Why did you raise your arm?", and he answers: "I didn't. My arm moved by itself." And in fact the movement has been caused by the surgeon's having applied an electrical stimulus on the patient's motor cortex.[1] The patient was not conscious of any

[1] The feeling that the movement had not been made by oneself was systematically reported by the patients studied by W. Penfield and others with electrical stimulation of the motor cortex (Penfield, 1975).

decision by himself to perform the movement, so he does not experience it as a voluntary act.

A person's usual conception of his or her own voluntary acts seems to be in conflict with the idea that all events in the world are causally determined. According to classical physical theory, everything that happens is wholly determined by previous events. So, if one thinks one has done something because one has chosen to do so, one will not easily accept the idea that in fact this act was already completely determined before one's decision. The idea of choice itself implies that one could as well have chosen to do something different.

The evolution of physical theory has changed this deterministic view of the world. At the quantum level, events are now considered to be, up to a certain point, undetermined, that is, subject to probabilistic (and not strictly deterministic) laws. And, according to modern theories, a series of random events, at the microscopic level, can initiate a causal chain that produces an event that is observed at the macroscopic level. However, this change in physical theory brings no solution to the problem of causation of voluntary acts, as considered from the first-person perspective. The idea that one's voluntary acts are in fact determined by chance is no more akin to the intuition we have of our free actions than the idea that they are strictly determined by previous events. When I do something voluntarily, the impression I have is that I do it because I have chosen to do so for some reason, and this does not seem compatible with the idea that my action was the result of random fluctuations of quantum or other microscopic events in my brain. Reasons and choice seem as different from chance as from causes.

It is difficult, then, to reconcile our naturalistic view of the physical world with the idea that we ourselves, as voluntary agents, are part of this physical world. The dualist thesis is of course a solution to this dilemma. According to this view, purely physical events, including those of our bodies, are wholly determined by causes and chance, but our minds are not a part of the physical world. Mind is something of a completely different nature, and when the mind chooses to do something, this act of will is purely spontaneous, that is, it is not caused

by anything else. The difficulty with the dualist position, however, is that it brings a whole series of other, unsolved and well-known problems. In relation to voluntary actions, too, the dualist thesis has to face a specific problem. Some people (schizophrenic people) sometimes have the impression that they are not the agent of some of their actions. They do not feel these acts to be determined by themselves or to be the result of a conscious decision of theirs. They believe them to be controlled by someone else. This condition, however, can be eliminated by the introduction of certain chemical substances (neuroleptic drugs) in their brain. So it seems that the feeling itself that gave our initial definition of voluntary acts is dependent on chemical events in the brain.

If we switch now to the monist position, we may be led into thinking that, since our decisions will in any case be determined by the causal factors that are present and by random fluctuations in probabilistic events, we should not worry about them at all. We should not try to think which is the best thing to do, we had better just let the events happen in our brains, and do whatever these events determine. There would be no sense in considering an action to be right or wrong, good or evil. Nobody should be considered guilty or responsible, for whatever they do will have been determined by causal processes in their brain, over which they have no control.

A certain amount of reflection, however, will show us that these conclusions are unfounded. They do not really follow from the monist position. The materialist monist position maintains that the mind is identical with complex states and processes of the brain. It is based on the third-person perspective. It concerns explanation, so there is no place in it for prescription. In an explanation, there is no place for 'should'. When it was said, in the previous paragraph, that we should not try to choose our actions, there is an inherent contradiction in this. This prescription itself supposes the capacity of choosing -- paradoxically, choosing not to choose, for the reason of considering that there is no real choice! If we say: 'we *had better* just *let* the events happen', we are assuming the capacity to choose and to do what we freely decide.

However, from the third-person perspective -- which is anyway the proper perspective for explanation --, there is not so much difficulty in considering choice, decision and action as part of the natural world. Even other people's first-person perspective on their free decisions and action, when I consider it from my third-person perspective -- in fact, even my own first-person perspective, when I consider myself "as someone else" -- is compatible with a naturalistic view of the world. All we need is to suppose that there is, in human beings, a decision system that can represent actions and action sequences before their performance, that can select among them, and the output of which is not fully determined by its input, but also by its internal state, by representations of aims to be achieved, by internal criteria that affect its activity (moral and other personal values), and also by a certain degree of randomness (which gives the arbitrary character that our choices often have).

It is reasonable to think, then, that since we are made up this way, we will always be choosing and acting upon our choices. Even if we abstain from choosing, we will only be choosing to abstain from other choices. As an existentialist thinker once said, "we are condemned to be free". Being free is simply in our nature, as a consequence of the way in which our brain functions. It is clear that, from this point of view, being free is not incompatible with natural causality. However, from the first-person perspective, I can have no access to the causal determination of my choices, thence the impression that they are not caused at all. We may recall here a statement by Max Planck (1945, quoted by Kornhuber, 1992) : "From the outside, objectively considered, the will is causally tied; from the inside, subjectively considered, the will is free".[2] But I argue that from the third-person (objective) perspective we can also apply a concept of freedom to the will, though one that does not imply absence of causality.

Some will say that, on this account, free will is an illusion. But I do not think this is a necessary conclusion. When I feel my acts to be free, I feel that they are not caused by

[2] (My translation.) "Von aussen, objektiv betrachtet, ist der Wille kausal gebunden; von innen, subjektiv betrachtet, ist der Wille frei."

external factors, but that they are determined *by me*. ('External factors' here means: factors external *to me*, to my *self*.) This need not be considered an illusion. If the "I" is such a system as we have roughly described above, we can consider this intuition to be essentially correct. It all depends of the concept we have of the self, of the "I". When we see our actions as determined *by ourselves*, this can be considered to be right. It is when we consider our *self* to be pure spontaneity -- a being that is not subject to causality -- that we are in illusion.

"Why did you do this?", someone asks me. "Because I chose to do it", I answer. "Why did you choose to do it?", she asks, and I give my reasons. (Of course, these reasons can be true or false -- and even if true, they may give an only partial justification for my action.) "But why did your reasons lead you to choose to do this?", she asks. If I am not to give further reasons, which would only lead to the question being asked again, then from the first-person perspective the answer can only be: "I do not know". Only from the third-person perspective can we try to find the causes for our reasons and our choices.

From the first-person perspective, *I* am the cause of my actions. But what am I? The incompatibility between free will, as seen from the first-person perspective, and natural causation dissolves if we adopt the "astonishing hypothesis" (to use Crick's phrase; Crick, 1994) that we ourselves, as free agents, are brain systems capable of choice, decision and action. This is the "compatibilist" position concerning free will, that is, one that considers free will as compatible with natural causality.

3. The readiness potential and the initiation of voluntary action

Let's now consider the readiness potential. In 1964, using a new method of reverse computation of stored electroencephalographic (EEG) data, Kornhuber and Deecke discovered that self-paced voluntary hand or foot movements are preceded by a slow negative cortical potential (Kornhuber & Deecke, 1965). Movements were voluntarily performed by the subjects, following the instructions given, at moments that were determined by the subjects themselves, independently of any external stimulus. The potential preceding the movement was called *'Bereitschaftspotential'* or 'readiness potential'

(RP), this term implying a process of preparation for the movement. The interval between the beginning of the potential and the start of muscle activity varied from 0.4 to 4 s, being on the average 1-1.5 s (Kornhuber & Deecke, 1965, pp. 4-5). In a later series of experiments, average onset of RPs was 750 ms prior to finger flexion (S.D., 360), but it could start as early as 1.5 s or more prior to movement onset (Deecke et al., 1976, p. 101). As the authors remark, such an early onset time rules out the possibility that the readiness potential corresponds to the motor command, so they take it to indicate a process of preparation of the movement (ibid., p. 113).

Libet and his colleagues made RP measurements in which they tried to minimize any process of conscious or nonconscious preparation of the movement. Each trial was an independent event and there was no limitation on the time in which to perform the act. Furthermore, an additional instruction was introduced, asking the subjects "to let the urge to act appear on its own at any time without any pre-planning (...) i.e., to try to be 'spontaneous'" (Libet et al. 1982, p. 324). In series in which the subjects reported no pre-planning, RPs were shorter (what the authors described as 'type II' or 'type III', with mean onset time 577 ms and 240 ms prior to movement onset, respectively; S.D. 151 and 47, respectively) (ibid., table I, p. 526).

What kind of preparation is then indicated by the readiness potential? And what is the temporal relation between the voluntary decision to perform the movement and the RP? If these acts are determined by a conscious decision of the subject, must this conscious decision precede the brain events reflected in the RP? If, on the contrary, the RP starts before the conscious decision to act, one could ask how the brain can start preparing an action before the mind decides to make it. How could the brain know in advance that the mind was going to decide to perform the movement at that precise moment?

Let us consider that these acts are determined by the self (or the "I") or by free will. Let us use here the term 'the free agent'. Now, we have two alternative possibilities. First, we may consider free will to be the activity of a brain system (see the previous section). We may

consider the free agent to be a brain system, or the activity of some brain structures, according to the materialist theory of mind-brain relation. If so, the readiness potential, since it always precedes these voluntary acts, will be seen as an expression of the workings of this free agent itself (or of processes derived therefrom).

Second, we may consider free will as the activity of an immaterial mind. According to the interactionist dualist theory of mind-brain relation, the free agent is not a brain system, but something that acts on the brain to make it perform the actions that this free agent decides. In this case, we get a temporal problem. Since the RP always precedes these voluntary acts, it certainly reflects the brain activity that prepares the performance of these acts. Now, if these acts are determined by something that is external to the brain, then the mental decision that determines the act must *precede* any preparation of it, so that it may in fact *cause* it. So the conscious decision must precede the RP. And since the RP often lasts half a second or more, before initiation of the muscle contraction, there would be a gap of this duration between the mental decision to act and the motor act.

However, we have seen that an essential constituent of our intuition about voluntary acts is that they are caused by a *conscious* decision. And *we are not conscious of such a long gap between our conscious decision to act and the act itself.* On the contrary, in situations such as those in which the RPs were recorded, we consciously perceive the motor act as *immediately* following the conscious decision. One should recall that subjects were not instructed to decide the moment of performing the movement, wait for about half a second, and then move. Clearly, they performed the movement as soon as they decided to do so. So how could there be such a long interval between the conscious decision, preceding the RP, and the movement? The experimental fact seems to pose a serious difficulty for the dualist hypothesis.

Eccles, a supporter of interactionist dualism concerning mind-brain relation (Popper & Eccles, 1977/1983), tried to surmount this difficulty with an ingenious hypothesis. According to this hypothesis, there are spontaneous fluctuations in cortical activity (not visible in the

EEG) and "there is a tendency for the initiation of the movements to occur during the excitatory phases of the random spontaneous activity" (Eccles, 1985, p. 542). The earlier phase of the RP (up to about 200 ms before the movement) would then reflect this spontaneous activity, of which the immaterial mental event then takes advantage in order to produce the voluntary action. The hypothesis thus preserves the essential character of interactionist dualism (ibid, pp. 542-543). This hypothesis implies that spontaneous fluctuations in the global activity of large populations of cortical neurons, such as those reflected in the earlier part of the RP, should regularly occur, independently of any intention or movement, so as to allow the production of voluntary acts. In fact, the supposition that the earlier part of the RP reflects a spontaneous fluctuation, that is not necessarily linked to the preparation of an action, is a viable specific hypothesis, and it is not necessarily dependent on Eccles' dualist theory of action determination by an immaterial agent. This specific hypothesis would be very difficult to test, due to the absence of a common reference time from which to average different EEG tracings of subjects at rest. In fact, in a single EEG tracing the RP itself is not visible. As explained above, one needs to average many EEG tracings to obtain the RP, and a common reference time is necessary for this (in the case of voluntary acts, it is the movement onset time). At present, there seems to be no way of testing this hypothesis, but in principle it should be testable.

Libet, faced with the available experimental evidence, preferred to accept the conclusion that voluntary acts are nonconsciously initiated. For him, this in fact implies that they are not initiated by free will. "Clearly, free will or free choice of whether 'to act now' could not be the initiating agent, contrary to one widely held view" (Libet, 1992, p. 269). However, he was not willing to consider free will as a complete illusion. He argued that, even if voluntary actions are not initiated by free will, they might still be controlled by free will. According to his data, consciousness of the intention to act seemed to precede the muscle contraction by about 200 ms. Libet argued that during this period, the subject might either veto the act or allow it to proceed to motor completion. "The findings should therefore be

taken not as being antagonistic to free will but rather as affecting the view of how free will might operate" (Libet, 1985, p. 538). He considers that for this conscious 'veto' or 'trigger' to be really free it must not be caused by neural events. "For *control* of the volitional process to be exerted as a *conscious initiative*, it would indeed seem necessary to postulate that conscious control functions can appear without prior initiation by unconscious cerebral processes, in a context in which conscious awareness of intention to act has already developed" (Libet, 1985, p. 538).

However, it must be emphasized that this supposition, whatever its intrinsic value, does not give us back the intuition that the *initiation* of the act itself is free. As Bittner remarks, "his hypothesis does not give us back a recognizable concept of voluntary movements nor vindicate our feelings of being in conscious control" (Bittner, 1994). According to Libet, actions such as the voluntary wrist flexions performed by his subjects when they decided to do it are free because the subject could have vetoed them. But what about what we are conscious of as being a free decision that really *initiates* the voluntary action? What about the intuition we have that our actions are really *initiated*, and not only controlled, by ourselves, and not by something else? What about our feeling of being the true cause of our actions? Libet's account gives no explanation of this intuition. If one accepts his interpretation, one will be obliged to consider this intuition as an illusion. According to him, there is no free will for creating actions, there is free will only for censoring them—allowing some to pass and forbidding others.

4. Problems with the concept of intention

There is an ambiguity in the usual meaning of the word 'intention'. In discussions of action, the word is often employed in relation to the mental event that is taken directly to cause the voluntary act. However, one can also have an intention to do something at some time in the future, without deciding to do it now. In this case, the word merely indicates a representation of an action to be performed in the future. In the first sense, the intention is what effectively causes the action. In the second sense, the intention is a mental state that

predisposes the subject to the action but is not sufficient to produce it *now*. The final decision to act is still needed. For the first sense, we may prefer to use the word 'decision', as I did in the last sentence. But we must recognize that this word in fact also has the same ambiguity, since we may decide to do something without doing it now. To completely avoid ambiguity, it would perhaps be necessary to say: "the irrevocable decision to act now". I believe that our usual concept of voluntary acts imply that these are caused by a free irrevocable decision to act now. (The concepts of wish, desire, wanting or urge, just as the intention in the second sense above, do not imply an irrevocable decision to act now.)

However, as I will explain later in greater detail, I believe there is another distinction to be made. Libet's observations of aborted actions show the need for such a distinction. His subjects sometimes reported that they had experienced an urge or intention to act *now* that was not in the end followed by a movement (see section 5). So we should distinguish three different mental events: the intention to act at some time in the future, the intention to act now and the irrevocable decision to act now.

I believe we should admit that every voluntary action is preceded by an intention to act now, in the sense of a representation of the action that precedes its performance. But I argue that this intention does not always become conscious as a separate event. For it to become conscious as a separate event, it must become conscious before performance is started. If it does not, consciousness of the intention to act now merges with consciousness of the action itself. As noted in the previous paragraph, I also argue that it should be distinguished from the decision to act that immediately causes the action. How do we experience this decision that immediately causes the action? I argue that we do not experience it as a separate event, but as a part of our experience of the action itself. We distinguish very clearly between an involuntary movement and a voluntary one, even if it is made so suddenly and spontaneously that we have no consciousness of intention prior to the action itself. We feel that the voluntary movement was caused by a decision of our own (sometimes also called 'intention', see previous paragraph), so this decision is experienced

as something that precedes the movement, but this experience does not occur before the experience of the movement. It is integrated into the experience of the movement itself.

In order to appreciate the distinction between a voluntary and an involuntary act, take the case of a person who has a tic and at a certain moment decides to imitate his own tic. If he succeeds in the performance, he will feel the movement itself to be essentially the same in the two cases. However, he will also be conscious of a clear difference between them. He will feel that, in the first case, the movement "happened" to him, whereas in the second, *he made* the movement. In the second case, he will be conscious that the act was caused by a decision to make it.

The word 'intention' may also be used in a third sense, to indicate the aim or purpose of an action. The question 'What was your intention in doing that?', for instance, implies that before the action the subject wanted to reach a certain end and performed the action as a means towards this end. In this case, 'intention' denotes not a prior representation of the action, but a prior representation of the end to be reached through the action.

5. Libet's solution to the problem of the free determination of voluntary acts

Some subjects told Libet that, on some occasions, they felt as if they were going to perform a movement but in fact did not. It seemed they had the wish to make the movement but then aborted it. Libet tried to reproduce this phenomenon in a way that allowed the study of RPs. Of course, in spontaneous instances, the presence of an RP cannot be determined, for there is no time reference from which to average different tracings. So Libet instructed the subjects to prepare to make a movement at a pre-set moment, as indicated by the position of the revolving spot they were looking at, and veto the movement about 100-200 ms before this pre-set time (Libet et al., 1983b). The pre-set time served then as the zero-time for the backward computation of the RP. It was shown that this procedure produced RPs that were to begin with similar to those obtained with real movements. Then, about 200 ms before the pre-set moment, this potential started to fall, contrary to what happened with real movements.

Libet interprets this as indicating that the conscious decision to veto the movement can in fact abort it after the subject has become conscious of the intention to move. And, since he thinks that a decision cannot be regarded as free if it is made unconsciously, he concludes that it is here that free will may operate. The experimental facts had imposed on him the idea that the initiation of an action is not caused by free will, since it precedes consciousness of the "decision" to act. So the real decision, for him, comes after consciousness of the illusory decision, in allowing the action to proceed or vetoing it. "[W]e arrive at a conscious specific 'action intention' (to move now) *and* a subsequent 'decision' (whether or not to carry out the action-intention), both processes occurring in sequence just before the time of action" (Libet, 1987, p. 320). So it seems he wants to keep the word 'decision' for what happens *consciously* (and not *before* consciousness). We must note, however, that it is only the decision *not* to carry out the action-intention that may be experienced as a discrete event. As I argued in the previous section, conscious experience of the irrevocable decision to act now is incorporated into consciousness of the action itself.

The possibility of vetoing the action after becoming conscious of an intention to act is thus essential to Libet's conception of free voluntary acts. And he takes this conscious veto to be a purely spontaneous event, not determined by causes. "The potential for such conscious veto power, within the last 100-200 ms before an anticipated action, was experimentally demonstrated by us" (Libet, 1993 p. 134). Of course, it is only the *potential* for such conscious veto power, and not this kind of conscious veto power itself, that was experimentally demonstrated. Libet himself admits: "There is nothing in our new evidence to entail that a conscious veto or trigger is not itself initiated by preceding cerebral processes, as correctly noted by a number of commentators" (Libet, 1985, p. 563). The only argument he has in favor of his conception is that "there is presently no directly applicable evidence *against* the appearance of a conscious control function without prior unconscious cerebral processes" (ibid.).

Of course, everybody has already had the experience of giving up the intention of doing something at the last moment, that is, of having almost done something before aborting the action. Retrospectively, one experiences that one "had almost started" the act and then refrained from carrying it out. Of course, 'having almost started' means not having started. But besides this negative meaning, what is its *positive* content, so that it may be experienced as something that really happened? It can only be an intention to act now involving a real preparation for action, that in this case is dissociated from the irrevocable decision to act, since the performance of the action itself is not triggered. This does not mean, however, that in the case of effective action the subject necessarily experiences first this kind of preparation to act (an intention to act *now* that is not yet a *decision* to act now). Nor does it mean that the irrevocable decision to act now can only occur after consciousness of this intention to act now (that, according to Libet, is non-chosen). In *some* cases, we *may* experience a prior intention to act now, but we do not have the additional experience of triggering or "not vetoing" this intention, as a discrete experience that precedes the experience of the act itself. As I have already said, experience of deciding to act is an integral part of the experience of the action itself. And very often the prior experience of an intention is absent; we experience only the suddenly decided and performed action.

Indeed, even in the case in which the subject experiences that an impending action has been aborted, it is debatable whether the word 'veto' is a good description of his experience. In spontaneous cases, a more suitable description is perhaps that the final decision to move simply did not occur, although the subject has the experience that it almost occurred. It seems it is more a case of *not* having decided than of positively vetoing an impending event. In the experimental case of the "pre-set veto" (Libet et al., 1983b), subjects reported having experienced the intention to act and the active process of stopping the intention. However, the situation seems to be different from that of opposing, for instance, the felt impulse to sneeze or burp (Bittner, 1994), since one feels not only the active opposition but the process itself that is being opposed as caused by one's own will.

Libet is right in saying that when we are conscious of an intention to act before performing the act, we feel we can stop ourselves from performing it (Libet, 1993, p. 134). But this is not the only basis for our common intuition that our voluntary acts are free. In the case of a purely voluntary act, such as the hand movement performed by Libet's subjects at an arbitrary moment, we also feel that we could have had no intention to perform it in the first place. In other words, we feel it is up to us also to initiate the action, and not only to stop ourselves from performing it (Bittner, 1994, chapter 3, section III). The intention to act now that precedes the act is not experienced as an autonomous event that is independent of our free will. On the contrary, *it is experienced as an expression of our free will*. Trying to give a verbal expression to these experiences, the intention to act now is experienced as something like "I am going to do this now". It is not passively experienced as something like "Here comes the intention to do this". It is also different from a wanting or wish, which is something like "I would like to do this now". The "veto" experience would be something like "I am going to do this now... no, not really". The decision that causes the action, on the other hand, is not experienced as something like "I am deciding now that I am going to do this". It is experienced as something like "I am doing this because I have decided to".

The importance of Libet's pre-set "veto" experiments, to my mind, is not that of demonstrating the possibility of giving up a conscious intention to act. We already knew of this possibility from common experience. I believe the new and important fact revealed by these experiments is that an RP may occur in the absence of any act. Libet has shown that the RP is not a sufficient condition for an act to occur. Thus, it should not be identified with the irrevocable decision to act of which we are conscious as being the cause of our voluntary acts.

6. What are voluntary acts, conscious acts and conscious decisions?

In order further to discuss the relations between volition and consciousness, we must first discuss the concepts of voluntary acts, conscious acts and conscious decisions, since

these terms may be used in different senses and be associated with different theoretical and philosophical presuppositions.

1. A conscious act may be conceived as:

(1a) An act of which we are conscious. This simple definition is compatible with two very different concepts of consciousness (Rosenthal, 1986; see also Gomes, 1982; 1995). According to the first one, consciousness is an intrinsic property either of all mental states or of some of them. A mental state (or a conscious mental state) is conscious in itself, it does not need anything else to be conscious, and a person is conscious of a mental state simply by having one (or by having one of this conscious sort). According to the second concept, what makes a mental state conscious is the presence of another mental state, which is a sort of internal perception of the first one or else a special kind of thought about it. The person who has this second-order mental state is then conscious of the first-order mental state. Proposition (1a) is also compatible with either an identity-theory or a dualist view of the mind-brain relation.

(1b) An act that is decided after consciousness of the intention to act or after consciously imagining the act. One first consciously thinks about an act and then makes it, so one is fully conscious of the act before making it, and this consciousness participates in the decision to make it. Although this use of the terms 'conscious act' or 'conscious action' is very common, I prefer to use here the term 'deliberate act'. The reason is the need for a term to indicate simply the acts of which the person is conscious (proposition 1a).

2. A voluntary act may be conceived as:

(2a) An act that is felt by the subject to have been caused by a conscious decision. This raises the question of what a conscious decision should be considered to be.

(2b) An act that is decided after consciousness of the intention to act or after consciously imagining the act. In this sense, 'voluntary act' is synonymous with 'conscious

act' in sense (1b). As I have already said, I propose to use the term 'deliberate act' in this sense.

3. A conscious decision may be conceived as:

(3a) A decision of which we become conscious, but which may exist and produce effects before that.

(3b) A decision that is intrinsically conscious, and so can only produce effects after we are conscious of it. Two alternative possibilities may complement this proposition:

($3b_1$) This intrinsically conscious decision is not determined by causes. This is in accordance with the conception that a mental event that is fully determined by natural antecedent causes cannot be considered as really free. Free will is considered incompatible with causal determination.

($3b_2$) This intrinsically conscious decision is caused by prior neural events.

Of course, there may be other concepts or hypotheses about conscious acts, voluntary acts and conscious decisions. I have just indicated those that are relevant to the present discussion.

7. What is the relationship between voluntary acts and conscious acts?

If one adopts propositions (1b) and (2b), 'voluntary acts' and 'conscious acts' are two ways of saying the same thing.

If one adopts propositions (1a) and (2a), voluntary acts are conscious, but they may be either thoughtlessly spontaneous or deliberate. In the first case, one is conscious of both the act and the decision that caused it, but only after its performance has already started. In the case of a deliberate act, by contrast, one is also conscious of the intention to act now before starting its performance. On the other hand, conscious acts may be voluntary or involuntary. A tic is involuntary but the subject is conscious of performing it.

If one adopts propositions (1a) and (2b), then conscious acts may be voluntary (that is, deliberate) or non-voluntary. In this case, an impulsive or thoughtlessly spontaneous act is considered as non-voluntary, although conscious. This position fails to differentiate between non deliberate acts and truly involuntary acts such as tics. In the case of an impulsive act, for example, one feels that it was caused by one's will, even though one started it without consciously thinking that one was going to do it. In the case of a tic, on the contrary, one feels that the act was not caused by one's will.

If one adopts proposition (3b), the distinction between (2a) and (2b) disappears. So rejecting (2b) in favor of (2a) implies adopting (3a). If one adopts (1b) and (2a), rejecting (2b) and so adopting (3a), then conscious (i.e., deliberate) acts are voluntary, but voluntary acts may be conscious or not. Impulsive or thoughtlessly spontaneous acts are now called voluntary, but they are not considered as conscious acts. In this case, the adjective 'conscious' is used differently when it qualifies acts and when it qualifies decisions. If a conscious decision is just a decision of which we become conscious (according to (3a)), it would seem more coherent to define a conscious act as just an act of which we become conscious (proposition (1a)).

My own preference is for propositions (1a), (2a) and (3a). According to these, conscious acts may be voluntary or involuntary, and voluntary acts are conscious, but not all are deliberate. Some are impulsive or else just thoughtless, but they are nonetheless voluntary and conscious. In those non-deliberate acts, we are not conscious of the intention to act now before acting. One is not conscious of what one is going to do before doing it. But during the act or after it, one has nevertheless the feeling that it was caused by a decision of one's own.

8. What is the role of consciousness of the intention in voluntary acts?

If one adopts propositions (2a) and (3a), consciousness of the intention to act now has a role only in deliberate actions. In these, since the subject is conscious of the intention

to act now before starting performance, this consciousness of intention may affect his or her final decision. In the case of non deliberate acts, there is no prior consciousness of an intention to act now. (This is not to say that consciousness itself has no role at all in the determination of non-deliberate acts, since they derive from conscious experience of the situation in which the subject is.)

If one accepts (2b), consciousness of the intention has a role in all voluntary acts and it becomes difficult to explain the difference between deliberate and non-deliberate acts. And, as we have already noted, if one accepts (3b), one also accepts (2b).

What about consciousness of the irrevocable decision that immediately causes the action? I argue that we should not only accept (3a) but also admit that this decision in fact causes the action *before we become conscious of it.* Thus, consciousness of this decision has no role in the causation of this very same action, since it only occurs after performance has already started. Again, this is not to say that consciousness has no role in voluntary action, since consciousness of the intention is important in deliberate actions, and consciousness of the situation is determinant in both deliberate and non-deliberate voluntary actions. Besides, consciousness of the final decision, as a part of the experience of the action itself, may have an important role in the subsequent correction of the action or in the causation or avoidance of other actions. It is essential, among other effects, for the occurrence of guilt feelings, which typically do not occur with truly involuntary acts.

9. Are conscious actions nonconsciously initiated?

I think we should agree with Libet that conscious actions are nonconsciously initiated, in the sense that the subject is not conscious of the beginnings of the neural activity that eventually produces the motor act. Three facts converge to justify this conclusion. First, the long gap between the beginning of the RP and the beginning of muscular contraction (about half a second). Second, the fact that we can only become conscious of performing the act after the beginning of muscular contraction or at least after the final motor commands that

occur very shortly before it. Third, the fact that we are not conscious of any gap of similar duration between the decision that causes the act and the act itself, nor, in the case of deliberate acts, between the intention to act now and the act.

Of course, one could program oneself to perform the motor act only about half a second after the conscious intention. That is, one could time the movement so as to have the conscious experience of an interval of half a second between the decision to move and the movement itself. But in the usual case of a deliberate act, the subject has the conscious experience of performing the movement immediately after the conscious intention to act now. However, the RP indicates that neural activity had already started about half a second before the movement. Even though we should recognize that it takes some time to proceed from consciousness of the intention to the consciousness of the movement, it certainly does not take half a second. In half a second, for instance, we can see several individually perceived flashes, or hear several beeps, but we would not be able to see or hear them between the moment when we become conscious of the intention to act now and the moment when we become conscious of making the movement (if we make it immediately after the conscious intention). So, the onset of the RP cannot be the correlate of the conscious intention to act now.

We conclude that the first part of the RP manifests neural processes that are not reflected in conscious experience. Bittner makes the opposite claim. For him, the neural events measured by the RP are identical to the conscious decision (Bittner, 1996, p. 337). Accepting Libet's measure of the time of occurrence of the conscious intention (350 ms after onset of the RP), he interprets the interval between onset of the RP and occurrence of conscious intention as the time that is necessary for the decision to become conscious. "The subject becomes aware of the whole of the decision; though as with every causal-physical process, time is needed for the relevant events to occur" (ibid., p. 338). His reasoning is based on a theory of consciousness as a higher-order mental state. The decision is the first-

order state and consciousness of the decision is a second-order state caused by the former. It is reasonable then to suppose that the latter occurs some time after the former.

I agree with a great part of Bittner's reasoning. I also view consciousness as a higher-order mental state (Gomes, 1982; 1995; 1998a; 1998c) and I also believe there is reason to assume the presence of a latency for conscious experience of a first-order state (Gomes, 1998b). However, his interpretation does not take into account the fact that in usual cases we are not conscious of an interval of about half a second between consciousness of the intention and consciousness of the movement. If we assume a latency for consciousness of the intention, we should also assume a latency for consciousness of the movement, and the interval between the conscious experiences should be roughly equivalent to the interval between the first-order states. We are forced to conclude that the neural events that correspond to the intention to act now must occur much nearer the time of the movement itself. Those that correspond to the decision that causes the movement must occur still nearer in time to the movement. The first part of the RP must then correspond to a process of preparation of the decision that causes the movement. (The distinction I have made between the intention and the decision and the consideration of cases in which there is no conscious intention are also absent from Bittner's analysis.)

But why suppose, as Bittner does, that since its very beginning the RP must correspond to the intention of which we become conscious? Bittner believes it is necessary to make this assumption in order to preserve the intuition that our conscious decision (and not something else) causes the action. He considers there is a problem of agency here. "[T]he conscious decision, if it occurs at a moment (...) after the onset of the RP events, (...) cannot be the cause of the movement" (Bittner, 1994). Why not? Is this idea not a consequence of the assumption that a free personal decision that causes an action cannot be itself determined by causal factors? Why not consider the initial RP events as *a cause* (or a set of causes) *of the cause* of the movement? In my view, the initial RP events are a cause (or a set of causes, among others) of the intention to act now, or a parallel effect of the

processes that cause it; this intention to act now is a cause (among others) of the final decision to act; and this final decision is the event of which we are conscious as being the cause of our action. The case of spontaneously aborted movements, in which no movement follows a conscious intention to act now, and the case of aborted movements in the presence of RPs, in Libet's pre-set "veto" experiments, show that neither the initial RP events nor the conscious intention to act now are sufficient to cause the movement.

I believe we could picture the sequence of events thus: First, the neural events manifested in the initial part of the RP correspond to a process of preparation or formation of the intention to act. Then, at a certain point in time, comes the intention to act now (as a representation of the impending motor commands). Next, in the case of deliberate acts, comes consciousness of this intention to act now. After this, or directly after the nonconscious intention to act now in the case of non-deliberate acts, comes the final decision to act, which causes the action. After the final motor commands, or after the movement itself, comes consciousness of the action as caused by a decision of one's own.

A testable empirical prediction of this way of picturing the events is that the RP should be longer in the case of deliberate actions than in the case of non-deliberate actions.

In a different sense, however, we could say that voluntary acts are *consciously* initiated, since they are necessarily created on the basis of a *conscious* experience of the situation the subject is in. From this point of view, there is after all an intimate relationship between consciousness and voluntary action, even if the subject is not conscious of the first events in the causal chain that leads to an action, and even if in many actions he is not conscious of an intention to act now before the final decision occurs. Even in non-deliberate voluntary acts, causation of the act depends on consciousness--consciousness of something in relation to which the act is prepared. If the perception of an event in the environment does not reach conscious experience, one cannot undertake a voluntary action directly related to this event. Consider the case of blindsight patients, for instance, in which the responses

given in the forced choice situation are evidence of a nonconscious perception of the stimuli presented in the blind field. The voluntary action of giving a response is instigated not by the nonconscious perception itself but by the conscious acceptance of the instructions for "guessing". It is only the content of this "guessing" that is influenced by the nonconscious perception. In this sense, consciousness is indispensable for voluntary action.

Although consciousness is thus intimately linked with voluntary action, and even more with deliberate action, consciousness should be distinguished from the "acts of will" or volitional mental events. And these should not be considered to be made *by* consciousness. As Bittner remarks, being the subject of conscious experiences "is not all we are; besides the passive receiver of experiences we are also the one who decides and wills (...). Libet's subjects are not able to report their own acts of will, but only their experiences of these acts" (Bittner, 1996, pp. 338-339).

10. Are voluntary acts free?

According to Libet, the initiation of voluntary acts is not free, since it is determined by neural events that are not conscious. For him, an action can only be free if it is the result of a conscious decision. As we have seen, for Libet it is only the control of intentions to act, after they have arisen, that may be free. This free control of actions depends on conscious decisions, conceived according to proposition ($3b_1$).

For many thinkers, there is an incompatibility between freedom and causal determination of the will.[3] From this perspective, the neural events that initiate an action might well be naturally caused events, if we consider that it is only the subsequent control of intentions that is free. This free conscious control of intentions would not itself be caused by prior neural events.[4]

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[3] See, for instance, Campbell (1957).

[4] Libet does not commit himself to the view that initiation of voluntary acts is determined by neural events that obey natural causality (personal communication, 1999). But he seems to

In section 2, I have presented an alternative view of what it is for an action to be free. A free action is an action that is not automatically determined by external events, but is determined by the subject himself, by his will. But what is the subject? What is his will? If we admit that his will is the functioning of some brain systems of his, there is no incompatibility between an action being free and its being causally determined. *I* make my actions, it is not something else that makes them. But what am I? If I am a functioning body, there is no incompatibility between my agency and its causal determination. My mind is free to choose whether to accomplish a voluntary action or not. This means that the final decision is not determined by anything external to my mind. But what is my mind? If it is the working of some brain systems, the incompatibility concerns only causal processes external to these systems, not the causal processes that determine the functioning of these systems themselves. The subject feels that his or her actions are caused by himself or herself and that he or she may choose what he or she will do. Is this an illusion? According to this view, no, this is not an illusion. The illusion is to think that his or her mind is not subject to causality. And this is an understandable illusion, since there is no access to these causal processes from the first-person perspective. Even the feeling one has that one's choices could not be predicted with certainty, even if all the relevant facts were known, can be considered to be true, since, according to modern science, natural events do not always

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commit himself to the view that free conscious decisions cannot be caused by prior neural events, since he states that "[f]or *control* of the volitional process to be exerted as a *conscious initiative*, it would indeed seem necessary to postulate that conscious control functions can appear without prior initiation by unconscious cerebral processes..." (Libet, 1985, p. 538). He postulates this even though he recognizes, in response to criticism, that "[t]here is nothing in our new evidence to entail that a conscious veto or trigger is not itself initiated by preceding cerebral processes" (Libet, 1985, p. 563).

obey strictly deterministic laws. But the main point here is that the subject can have no first-person access to the causal determination of his or her own mind.[5]

One of the main concepts used to characterize free will is the possibility of doing otherwise (see, for instance, Taylor, 1974). An act is considered free when we think that the subject could have done otherwise in the same circumstances. But what are "the same circumstances"? These include, of course, all external events affecting the subject at that moment. We could also include here all the "somatic" states of the person, that is, all states of his or her body external to the nervous system, or external to those systems of the nervous system involved in mental events. We could even include in these circumstances many mental states, such as desires, beliefs and emotions. One could say, for example, that even having the same belief about X, even having the same desire concerning Y and even feeling the same emotion Z, the subject could have chosen to do otherwise. However, one could not include the activity of the deciding system itself in the list of circumstances. This would amount to saying that, even if the subject had decided to do the same thing, he could have decided to do otherwise, which is self-contradictory. When we think about the possibility of deciding to do otherwise in the same circumstances, the deciding agent is necessarily external to the circumstances. And if one says that the subject could have chosen to do otherwise even if all the preceding physical events had been the same, one is begging the question against the hypothesis that the subject itself is a physical system.

One could say that free will does not exist because our actions are determined by the world of causes and effects (which includes our brain) and not by our will. Or, from the opposite point of view, one could say that free will is not causally determined, because our free actions are determined by our will and not by the world of causes and effects. But in both cases one is admitting that the will is not or could not be a part of the world of causes

[5] Since Hume (1739/1965), some philosophers have argued for the causal determination of free choices, while others have argued against it (see Kenny, 1989). A useful discussion of the subject is given by Patricia S. Churchland (1996).

and effects, and this is not a necessary assumption. One is implicitly putting the self outside the natural world. Philosophically, this is an effect of the Cartesian heritage. And perhaps this is also part of our natural folk psychology. However, we can consider that in fact the self is part of the world of causes and effects. From this point of view, when we say that the subject could have done otherwise in the same circumstances, this should be interpreted to mean that, had the causal factors internal to the self (a subsystem in the brain) been different, this self would have exerted a different causal action on the rest of the world, even in the presence of the same external causal factors. Instead of thinking of a self facing the world and acting upon it, we should rather think of a self facing *the rest of* the world and acting upon it. We are part of the world. We, as agents that freely decide to do so or otherwise, are part of the physical world of causes and effects.

Another important concept for the characterization of free will is the concept of choice. Free actions are actions that are not only determined but *chosen* by the subject. For an action to be considered free, the subject must have chosen to do it, and this implies having chosen not to do otherwise. This means that the possibility of doing otherwise should not be just an abstract possibility, it should not be just a possibility that exists from the point of view of someone who considers the case from the outside. Rather, it should be a possibility for the subject himself or herself. The subject must be able to consider this possibility before the final decision to act. This means that the subject must be conscious of the intention to act now before acting. We conclude that only what we have called *deliberate* acts should be considered as really free.

Acts that are voluntary but non-deliberate would then manifest an intermediate degree of free will. They are determined by the subject, we consider that the subject could have done otherwise in the same circumstances, they derive from a conscious experience of the situation in which the subject is, but they were not consciously chosen, in the sense that they and the possibility of doing otherwise were not consciously considered by the subject before starting their performance.

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