

1 Toward a Science of Volition

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This book aims at improving our understanding of the processes supporting voluntary action by looking at conditions in which the will is impaired or even breaks down. We use this introductory chapter to prepare the ground for contributions by philosophers, psychologists, neuroscientists, and psychiatrists that tackle the experience of acting intentionally, the ability to make decisions and implement one's goals, and the many ways in which the experience and the exertion of willful behavior can be disturbed. In the first part of this introduction, we describe the status of the will as we see it in present and past thinking. In the second part of the chapter, we provide an overview of the contributions in this book.

1.1 Studying the Will

When trying to decipher the forbidding complexity of the mind/brain, the standard simplifying assumption is that it is an "input-output system" in which perception goes in and (control of) action eventually comes out. We experimenters then work from the outside in, first getting control and understanding of the peripheral input systems, and postponing difficult questions about the center, which is shrouded in fog and mystery. This makes sense but risks distorting our vision of the whole, since we seldom if ever find ways of even posing questions about the requirements for the more central components that must eventually get transformed into the highest levels of outbound or "inside-out" traffic.

This potential for distortion is exacerbated by two further sources of distraction: introspection and the demands of free will. Introspection seems at first to be a godsend: Just as our inbound journey through the brain gets hopelessly beset with uncertainty and confusion, along comes introspection, the "first-person point of view," a well-positioned insider who can cut through the fog with a near-miraculous "access" to these central goings-on. The price we pay is that it is far from clear how to translate the mind-talk of introspection into the language of cognitive neuroscience. Nor is it clear when the deliverances of this embedded spy in terra incognita

are reliable. The other perhaps even more serious source of distortion is the ideological conviction that we need to preserve, somewhere and somehow in this foggy center, a radical disconnect of some sort that will leave elbow room for free will.

This is often described as a philosophical concern, but it is not just the preoccupation of philosophers. The undertaking of science itself apparently calls for it: When investigators take themselves to be able to manipulate an input variable independent of the phenomenon being studied, they presume, do they not, that they are the origin of the manipulations or choices, not causally coupled with the phenomenon or a mere way station being driven (by some other phenomenon) to choose the manipulations they choose. Scientific investigation in any field thus apparently depends on the autonomy or freedom of the investigator, and this idea that some human actions have to be causally insulated or privileged in some special way has motivated a variety of speculative theories of how this might be accomplished, science-fictional at best and often simply incoherent. Infinite regress threatens at every turn. As Gilbert Ryle (1949) pointed out long ago, if what makes an action voluntary is that it is caused by an act of will, we need to ask if that act of will was itself voluntary and, hence, the effect of a prior act of will—and if not, how could an act of will that was not itself voluntary endow the action it causes with voluntariness?

Beset by such high-stakes theoretical demands, and such experimental intractability, it is small wonder that research on volition has lagged behind research on other aspects of the mind. However, intrepid forays into this long-shunned territory are at last under way, and as one might expect, even in advance of a clear theory, hard-won empirical details have a way of illuminating the theoretical prospects so that the imponderables do not look so unmanageable after all. When we look more closely at what is going on, the “extensionless point” of the self (Nagel 1979) expands into a spatially and temporally distributed self that can work its “miracles” with less than miraculous means. Some philosophers will probably continue to prefer their fantasies about “agent causation” and quantum amplifiers hiding in the convenient fog in the center of the brain, but the science of volition is poised to march past them and secure a theory that can finally make sense of the recursive, reflective control systems that make voluntary human action so deserving of credit and blame.

1.2 Action

Throughout centuries, science has approached human action in two major contexts—cognition and volition. In the context of *cognition*, researchers study how action is planned, controlled, and modulated *in response to conditions encountered in the environment*. Hence, cognitive approaches view actions from an outside-in perspective, examining how they are formed and informed by external conditions. Conversely, in the context of *volition*, researchers study how action is planned, controlled, and

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modulated *in the service of the agent's needs, motives, desires, or goals*. Hence, volitional approaches view actions from an inside-out perspective, examining how they are formed and informed by internal conditions.

Cognitive approaches to action have always been more elaborate and better developed than volitional approaches. Some reasons for this bias are rooted in the history, methodology, and theory of cognitive studies. Historically, the scientific study of the mind and the brain has emerged from epistemology, and epistemology has, of course, always been a lot more concerned with the outside-in rather than the inside-out perspective. Yet, later on, when the sciences of the mind and the brain had long broken away from philosophy and forgotten all about their epistemological roots, they still continued to prefer the outside-in over the inside-out perspective. One of the reasons why this bias was preserved, if not strengthened, is related to the methodology of experimental research. In experimental settings, where external stimulus conditions can be manipulated in a straightforward way, it is easy and natural to study action as a consequence of foregoing stimulation. This is not true of internal conditions like goals, or impulses of the will, which are, by their very nature, less accessible to such manipulations. Furthermore, this difference in methodology goes along with a related difference in theory: When it comes to theoretical accounts of action, external conditions, such as stimuli, may take the innocent role of *causa efficiens* for the action to follow, whereas internal conditions, such as goals, come close to the more precarious role of *causa finalis*.

Yet, science has not only preferred cognition but also avoided volition. Ever since, the will has been a sensitive subject. In some ages, it has been venerated as the incarnation of personhood and autonomy, whereas in other ages it has been disdained as an indecent faculty of the mind. As concerns *veneration*, take a look at *free will* as it appears illustrated in Cesare Ripa's iconology (Ripa 1709; see fig. 1.1). In this picture volition appears to be closely intertwined with notions of personal autonomy and freedom— notions that are deeply rooted in the ideological underpinnings of ethical, legal, and political systems (at least in modern Western civilization). Some even believe that these notions are too crucial for establishing these ideologies to be delivered to scientific discourse and enquiry. For instance, philosophers often claim that science has nothing to say about issues of personhood and autonomy: Addressing these issues is just their business. And the guardians of law and jurisdiction often contend that science may shake the legal system to its foundations and thus jeopardize our society altogether when it starts questioning free will, the Holy Grail of law and constitution.

As concerns *disdain*, take a look at the maid *Volition* as she appears illustrated in Ripa's iconology (see fig. 1.2). In a somewhat rough exterior, we see a person with loose hair, clothed in beggar's garments. As she walks about, haunting the air with her huge wings, in search of whatever high-flying goal, she is blind to her surroundings,



Figure 1.1

The notion of Free Will as illustrated in Cesare Ripa's (1709) iconology. We see a young and active nobleman, a sovereign vested with the power to take decisions and to reign accordingly. The tip of the scepter is split—a symbol for the option of having to choose between virtue versus vice. (Source: Ripa, C. [1709]. *Iconologia or moral emblems*. London. Online: [http://emblem.libraries.psu.edu/Ripa/Images/ripatoc.htm/.](http://emblem.libraries.psu.edu/Ripa/Images/ripatoc.htm/))



Figure 1.2

Maid Volition. Taken from the same source as figure 1.1.

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always running the risk of losing grip of the ground. This picture suggests that volition may be a harmful malfunction of mental life that may indicate an inappropriate power of the will. In any case we cannot fail to see that Maid Volition enjoys much less esteem than Prince Free Will.

As these contrasting views suggest, the will is not just a neutral and innocent faculty of the mind. Rather, discussions about the nature of volition have always been deeply intertwined with discussions about ethical and political issues. Historically speaking, the will started its career in theology and ethics, and then from there it made its way into law and politics. Only very recently has it arrived in scientific theory as well, yet leaving traces of its long nonscientific history. In medieval Christian theology and philosophy, human will was considered a derivative of the Will of God—to the effect that the will would never choose Evil, but always Good (i.e., resist desire and follow reason; cf., e.g., Taylor 1989; Romano 2004). In postmedieval times, the will became secularized and was now considered the faculty of making choices—choices that were now no longer intrinsically directed toward the good. Accordingly, since the good was no longer inherent in that faculty itself, that faculty now had to become the locus in individual minds at which all sorts of external regulations of human conduct had to be addressed. These could be regulations about Right and Wrong, or good and bad choices, about ways of dealing with conflicts between incompatible choices, or even about the inclusion/exclusion of individuals with respect to the right of making choices. For instance, at certain ages, it may have been appropriate for priests and princes to make choices and decisions of their own, but not for servants and slaves to do so—appropriate for Prince Free Will, but not for Maid Volition. In this sense, the will is the psychological counterpart of ethics, law, and politics. The will has two faces to it. From the inside, it is a faculty of individual minds. From the outside, it serves as a theater for the impact of external regulation of individuals' conduct.

1.3 Volition

For the scientific study of volition we may, as a first step, turn to William James's treatise on the will in chapter 26 of *The Principles of Psychology*, which appeared more than a hundred years ago. James's treatise, which is an elegant piece of armchair psychology, is in fact a suitable starting point, because it absorbed, as it were, decades, if not centuries, of foregoing philosophical discussion and cast it in a convenient conceptual framework. That framework can still be used today as a guideline for sorting out major empirical issues that have to be addressed, as well as major theoretical problems that have to be resolved.

According to James's account, voluntary actions require that two conditions be met: (1) There must be an idea, or representation, of what is being willed, and (2) any conflicting ideas must be absent or removed. When these two conditions are fulfilled,

those ideas, or representations of intended goal states, have the power to generate the action. On this account, cognitive representations are in their very nature impulsive—to the effect that volition can be partly reduced to cognition. This is particularly true of those representations that refer to movements and actions. To these representations, a principle applies that James christened the ideomotor principle of voluntary action: “*Every representation of a movement awakens in some degree the actual movement which is its object; and awakens it in a maximum degree whenever it is not kept from doing so by an antagonistic representation present simultaneously in the mind*” (James 1890, vol. II, p. 526).

James believed that the volitional nature of cognition arises from learning. Whenever a motor act is performed, it goes along with perceivable effects. Some are close to the action in the sense of being accompaniments of the act itself, like kinesthetic proprioception of ongoing movements. Some others may be more remote, like a bell ringing at a distance when one’s finger operates a doorbell knob. Such regular connections between motor acts and their ensuing effects can then be functional in two ways. One is to generate forward models, that is, *anticipate appropriate effects, given certain acts*. The other is to create inverse models, that is, *select appropriate acts, given intentions to achieve certain effects*. This latter relationship, which leads from intended effects to acts, forms the functional basis of the ideomotor principle: Any representation of an event of which individuals have learned that it follows from a particular action will henceforward exhibit the power to call forth that action.

The ideomotor principle has received support from a great number of experimental studies (see Hommel et al. 2001 for an overview). Nevertheless, the Jamesian framework leaves us with a number of *issues for empirical research*. Major research issues concern, for example, the content and realization of intentions, the relation between processes of cognition and volition, the relation between making choices and implementing decisions, and the role of the temporal aspects of intended goals. These issues can be characterized in terms of distinctions like What/How, Mechanics/Dynamics, Selection/Implementation, and Acting/Planning.

1.3.1 What/How

First, empirical research needs to address What issues and How issues. Research directed at What issues tries to determine *what* people intend to do under given circumstances, how the contents of their intentions depend on internal and external conditions, and how they may change over time (i.e., *issues of motivation*). Conversely, research directed at How issues tries to determine *how* people realize given goals through actions. How does internal goal-related information interact with external environment-related information to generate appropriate action and bring forth intended effects (i.e., *issues of volition*)?

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1.3.2 Mechanics/Dynamics

Second, one of the major dimensions on which volition differs from cognition refers to what may be called temperature: We may distinguish between “hot volition” and “cold cognition.” Entities like motives, goals, impulses of the will, desires, and temptations are but insufficiently characterized by the mere contents they refer to. Rather, they have to be characterized in energetic terms as well and require functional architectures specifying both the cold mechanics of cognitive operations and the hot dynamics of volitional forces.

1.3.3 Selection/Implementation

A third aspect worthy of empirical investigation is the relation between volition as a faculty for decision making and goal selection, and volition as a faculty for the implementation of previously made decisions. Given that the question of free will is a central issue in the psychological and philosophical discussion of volition, it is not surprising that these and other disciplines have mainly focused on the decision-making role of volition. However, many disorders of volition are characterized by an impairment related to the implementation of decisions. Investigating the relation between the selective and the dynamic role of volition is thus an important issue for scientific investigation.

1.3.4 Acting/Planning

Finally, it may be useful to distinguish between volition with versus without a direct executional component. Processes underlying the will-in-action are often short-term operations, whereas processes underlying the will-in-planning are long-term. The processes underlying the will-in-action can be regarded as supporting action control, whereas the processes underlying the will-in-planning are of particular importance to self-control.

Yet, the Jamesian framework not only provides us with issues for empirical research but also confronts us with *theoretical puzzles and paradoxes* that pose severe challenges—partly to commonsense intuitions, partly to scientific theories.

1.3.5 Agency and Authorship

One such puzzle refers to agency and authorship. Central to our commonsense intuitions about the workings of the will is the notion that voluntary action, whatever the mechanics and dynamics of its underlying machinery may be, is ultimately directed, controlled, and—for that matter—*authored by a personal agent* within, or perhaps behind, that machinery. However, if one takes a closer look at it, the Jamesian framework has no role whatsoever for personal agents and authors. Instead, voluntary action is thought to emerge from, and be fully determined by, the mechanics and dynamics of a

subpersonal machinery. In a way, we lose the agent while trying to explain her actions. Should we be concerned about this loss or should we perhaps be relieved about it?

1.3.6 Mental Causation

A further puzzle relates to mental causation—a notion the Jamesian framework shares with folk psychology. Here the idea is that *mental kinds* such as intentions *have the power to cause physical kinds* such as bodily movements. This notion seems to entail a dualistic stance—at least as long as mental representations are considered as being incommensurate with the physical entities to which they refer. In everyday life we may be successful practitioners of such dualism, but in our scientific theories we should perhaps be concerned about it. Here it may be useful to distinguish between real and apparent mental causation (Wegner 2003).

1.4 Disorders of Volition

In this book we focus on ways in which volition can be impaired. Such impairments can be observed in a number of psychiatric and neurological disorders. While some of them—such as schizophrenia and prefrontal lobe damage—are clearly established as disorders of volition, others, such as depression or substance abuse, are perhaps less commonly regarded from this viewpoint. Still, we believe that investigating ways in which the will can be impaired or break down across different pathologies is a promising means to gain a better understanding of the nature of voluntary action.

As always, there are two ways to approach impairments and disorders. One goes from regular function to disorders. The other goes from disorders to regular function. We have planned the conference that provided the basis for this book in an attempt to go either way. These two approaches are reflected in the volume. On the one hand, we discuss the will and its pathologies from a more general point of view across different disorders. In that part, we mainly explore what is known about the nature of voluntary action in general, and how this knowledge can inform our understanding of disorders of volition. On the other hand, we focus on specific neurological and psychiatric disorders and discuss how they can be understood as disorders of volitional functions. We have decided to focus on four specific disorders rather than covering the neurological and psychiatric conditions that can be regarded as disorders of volition in an all-embracing way. We explore what is known about the nature of schizophrenia, depression, prefrontal lobe damage, and substance abuse and discuss how this knowledge can inform our understanding of the regular functioning of volition.

If it is true that the will is the psychological counterpart of ethics, law, and politics and serves as the psychological theater for the impact of the social environment on individuals' conduct, it will even more be true that notions concerning "disorders" and "regular functions" of volition will reflect moral, legal, and political conditions.

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This once more brings us back to Maid Volition. Her somewhat bizarre appearance reminds us that the dividing line between regular function and malfunction is, at least partially, a matter of cultural construction and may be subject to historical change. What the picture suggests is that volition and agency—which are nowadays considered respected functions of healthy mental life—were in her time regarded as malfunctions, indicating perhaps an indecent preponderance of self-governance over compliance with the divine and worldly order.

Accordingly, talking about disorders may easily turn into talking about exclusion—exclusion from those who are entitled to make choices of their own—and talking about exclusion may eventually turn into practicing exclusion in one or the other way. At this point, we should remind ourselves of the abhorrent examples of pushing exclusion to its extremes that took place at Kloster Irsee, the site of the conference from which this book emerged.¹ The conclusion to be drawn from this is simple enough: Since much of our intuitions about the divide between “good” and “bad” functioning reflects cultural—and even political—constructs rather than natural facts, we need to avoid any ontologizing of this divide—not only for the sake of preventing discriminations against those who suffer from bad functioning but also in the interest of scientific theory. Therefore, it may perhaps be wiser to speak of *varieties* rather than *disorders* of volition.

1.5 Approaches to Disorders of Volition

The contributions in this book are grouped into five parts. The first part presents different conceptual frameworks that identify the experience of agency, decision making, and goal pursuit as central components of volition (Metzinger; Bayne and Levy; Haggard; Proust; Ainslie; Cohen and Gollwitzer). The remaining four parts explore the question of how impairments in these and other aspects of volition manifest themselves as “disorders of volition.” The second part is concerned with the link between volition and certain symptoms in schizophrenia (Jeannerod; Liddle; Spence and Parry; Frith). The third part addresses impairments in the formation and implementation of intentions in depression (Nitschke and Mackiewicz; Schneider; Jouvent, Dubal, and Fossati). The fourth part deals with changes in action planning and decision making following prefrontal lobe damage (Owen; Grafman and Krueger; Burgess, Gilbert, Okuda, and Simons). The last part explores the relationship between decision making and substance abuse (Bechara; Sayette; Hull and Slone). In the following, we provide an overview of the contributions in each of the five parts.

1.5.1 Part I: Conceptual Foundations

The first four chapters in this part analyze the experience of agency. The authors of these chapters agree that the feeling of acting intentionally is “thin” and “evasive”

but merits theoretical analysis as well as empirical study because it is a fundamental component of volition.

In the opening chapter, Thomas Metzinger develops a model that accounts for the phenomenology of agency and describes the transition from willing to acting intentionally. Metzinger argues that for an understanding of volition, it is crucial to take into account the self-representational character of agency. Individuals not only form representations of goals but also form a representation of themselves as having goals. Metzinger suggests that a phenomenal model of the self is the causal mediator connecting a goal representation to the motor system, enabling the transformation of intentions into actions. In the final part of the chapter, he discusses akinetic mutism, a condition in which patients are awake but show no indication of intentionality in terms of this model: Metzinger argues that what these patients are missing is a representation of self in relation to action goals.

In the next chapter, Tim Bayne and Neil Levy “deconstruct” the phenomenology of agency. They assume that “there is no single experience of agency” and analyze different representational contents that contribute to the feeling of acting intentionally. In particular, Bayne and Levy discuss the phenomenology of mental causation, the phenomenology of authorship, and the phenomenology of effort. They propose that the experience of mental causation is neither necessary nor sufficient for the experience of will and place a form of experienced authorship—agent causation—at the heart of the experience of acting intentionally. The feeling of mental effort is assumed to support the experience of authorship.

The following chapter, by Patrick Haggard, shows that the analysis of the experience of agency is not restricted to theoretical deliberation but can benefit from experimental investigation. Haggard reviews laboratory studies in which he and his colleagues investigated the effects of intentions on the perceived time of actions and their effects. These studies demonstrate a strong temporal compression surrounding intentional action. Subjects perceive their intentional actions and corresponding action effects as closer in time than they really are, providing evidence for a strong link between intention and agency. Haggard discusses these findings in terms of motor control theory. He suggests that there is a specific conscious experience of preparing an action, emerging as a consequence of preparatory brain activity, whose phenomenal content is the anticipated action effect. Thus, prediction lies at the heart of the experience of conscious intention and agency.

In the contributions by Metzinger, Bayne and Levy, and Haggard, the experience of agency is analyzed with respect to physical actions. The last contribution on the experience of agency, by Joëlle Proust, adds a new perspective by raising the question of whether there is a sense of agency that is common to bodily and mental actions. Drawing on principles of hierarchical control theories, Proust sketches a theory of voli-

tion that accounts not only for willful bodily actions but also for willful thinking processes. She proposes that simulation operates at different levels of control to allow for the evaluation of actions from various perspectives. This theory allows her to explain two ostensibly disparate symptoms in schizophrenia in a unified framework, namely, the experience that one is not the author, or owner, of one's actions (delusion of control) and the experience that thoughts are inserted in one's mind and are not one's own (thought insertion).

Beside the experience of agency, another important component of volition is the ability to choose between competing goals and the ability to pursue goals over longer time spans. The last two contributions in the section on conceptual foundations are dedicated to these issues. George Ainslie presents a conceptual framework that allows him to explain principles of choice and to derive implications for self-control. Ainslie argues that choice is shaped by reward and is the result of a competition between behaviors that are associated with motivational states. He provides evidence that spontaneous choice in humans and animals is best described by a hyperbolic shape, where value stands in inverse proportion to delay, rather than by hierarchies of preference as proposed by traditional rational choice theory. Ainslie discusses how recursive self-prediction can account both for a surge in willpower when a current choice is seen as a decisive instance and for lapses in willpower when there is a one-time occasion to indulge.

What happens once an intention is formed? In the following chapter, Anna-Lisa Cohen and Peter Gollwitzer argue that the intention to achieve a certain goal is not a good predictor for goal attainment, as assumed by traditional goal-striving theories. They claim that "a second act of willing" is necessary, helping people to resume goals in the presence of competing alternatives. Cohen and Gollwitzer review a wide range of empirical findings to support the claim that forming a certain type of intention is an efficient means to forestall the second act of willing. They show that implementation intentions, which create a mental link between a specified future situation and actions to be performed in this situation, effectively facilitate goal attainment. The authors discuss the use of implementation intentions to ameliorate problems in goal pursuit observed in patients with frontal lobe damage, schizophrenia, and depression, thus providing a transition to the following parts of this volume that deal with specific disorders of volition.

1.5.2 Part II: Disorders of Volition in Schizophrenia

The contributions in part 2 discuss volitional impairments in schizophrenia from a behavioral and a brain perspective. Impairments in agency, which have been considered from a more theoretical perspective in part 1, are discussed in detail in the first chapter in part 2. The next two chapters in this part are dedicated to two other

categories of symptoms, disorganization and psychomotor poverty, and explore how these symptoms are related to impairments in volition. The last chapter discusses some new ways of thinking about volitional impairments in schizophrenia.

Following the conceptual approaches to agency in the first part, Marc Jeannerod proposes that feeling authorship of one's actions is crucial for the experience of intentional action. He reviews studies in which the origin of an observed action was rendered ambiguous or a systematic mismatch between performed actions and observed actions was introduced to investigate the cognitive and neural mechanisms involved in action attribution. These studies indicate that the inferior parietal lobe plays an important role in detecting discordance between observed and executed movements. In schizophrenic patients who show impairments in action attribution, activation in this area does not correlate with the amount of discrepancy between observed and performed actions. This suggests that these patients lack the cues for recognizing their own actions that are normally provided by changes in parietal activity. Jeannerod speculates that the origin of the action attribution impairments may be found in prefrontal areas that exert inhibitory control over areas involved in motor and sensorimotor processing.

In the following chapter, Peter Liddle presents an account of symptoms of disorganization, which may lead to serious impairments in volition. He proposes that the brain engages in different states of activity that are associated with characteristic patterns of distributed neural activities. Two of these brain states are the "default state," a state of introspective awareness of oneself, and the "motivated attention state," a state in which one is engaged in attending to salient information in order to perform a mental or physical act. Liddle provides evidence from brain imaging studies to support the claim that the recruitment of this motivated attention system is impaired in schizophrenia. He suggests that the recruitment problem arises from an impairment of the mechanism by which low-frequency oscillatory activity in the brain is generated.

Avolition, the lack of voluntary behavior, is in the focus in the following chapter by Sean Spence and Chris Parry. They review brain imaging studies from their own and other labs showing that the prefrontal cortex plays a key role in the generation of actions that are chosen and executed spontaneously. Spence and Parry provide evidence that psychomotor poverty, which incorporates avolition, not only exhibits a correlation with reduced activity in prefrontal cortex but is also associated with structural changes in prefrontal cortex. Given the possibility that plastic changes over time may modulate prefrontal function and structure, the authors discuss how certain therapeutic interventions might ameliorate volitional impairments in schizophrenia.

In the final chapter on schizophrenia, Chris Frith argues that some schizophrenic symptoms, such as delusions of control, thought insertion, and psychomotor poverty can only be understood by taking into account the social nature of cognition. In line with other contributions on agency, Frith proposes that delusions of control and thought insertion involve a failure in action attribution. However, he suggests that

this failure not only may result from impaired forward models in the motor system but could also be related to impairments in the intentional binding mechanism proposed by Patrick Haggard in part I. Such an impairment implies that the ability to understand others' intentions may be reduced. A further novel idea is that poverty of will and disorganization could result from difficulties in generating actions that are appropriate in a given social context. The proposal that volition and its disorders can only be fully understood when taking into account the social context also provides a new way of thinking about top-down action control.

1.5.3 Part III: Disorders of Volition in Depression

Symptoms of avolition not only appear in schizophrenia but are an important characteristic of impaired volition in depression. Accordingly, the three contributions in part 3 all discuss how impairments in the formation and execution of action plans lead to avolition.

Jack Nitschke and Kristen Mackiewicz propose that individuals suffering from depression have a desire to act but lack the ability to form and implement an action plan. They review findings showing that the dorsolateral prefrontal cortex plays a major role in the formation and implementation of action plans. Nitschke and Mackiewicz suggest that the inability of patients with depression to override established behaviors and initiate new goal-directed behaviors may be explained by reduced activity in left dorsolateral prefrontal cortex. An asymmetric pattern of frontal activity with more activity on the right may be related to withdrawal, negative emotions, and threat perception. Decreased activity in the anterior cingulate cortex is assumed to lead to impaired conflict monitoring and the selection and implementation of action plans. The authors discuss how treating volition as a central feature of depression may affect the understanding of volition as well as the treatment of depression.

In the following contribution by Werner Schneider, depression is also regarded as a misregulation of action control. In the first part of his chapter, Schneider outlines a framework for action control, specifying how goals compete, how an action goal is selected and implemented, and how the outcome of actions is monitored and evaluated. In the second part, he proposes that in depression, a chronic stress response due to repeated failures in pursuing action goals may lead to short-term and long-term changes in the brain structures supporting action planning. Schneider argues that the onset phase of depression is related to damage of the prefrontal cortex, with successive damage of the anterior cingulate cortex due to chronic stress leading to more severe forms of depression.

In the last chapter of this part, Roland Jouvent, Stéphanie Dubal, and Philippe Fossati focus on the role of cognitive flexibility and the ability to mobilize cognitive resources in volitional impairments observed in depression and anhedonia. They present evidence that faced with tasks that require cognitive effort, depressed patients

and anhedonics recruit more cognitive resources than controls. Jouvent, Dubal, and Fossati suggest that volitional impairments in depression and the loss of pleasure in anhedonia could reflect the exhaustion of cognitive resources.

1.5.4 Part IV: Disorders of Volition in Patients with Prefrontal Lobe Damage

The three contributions in this part analyze the volitional impairments observed in patients with prefrontal lobe damage. Although differing in the approach taken to identify the function of areas of the prefrontal lobe and the investigation of volitional impairments, these contributions provide converging empirical evidence that the prefrontal cortex plays a crucial role in the formation and implementation of intentions, as well as in decision making.

Adrian Owen reviews neuropsychological data to suggest that damage to the frontal lobes impairs the formation and implementation of conscious intention, whereas more automatic, stimulus-driven processes remain unaffected. Drawing on brain imaging and neurophysiological studies, Owen proposes that the midventrolateral cortex is especially important for intentional action. He presents data suggesting that activity in midventrolateral frontal cortex is associated with the intentional encoding of stimuli. However, this area does not seem to be restricted to intentional mnemonic processing, as it is also involved in other intentional processes such as the shifting of stimulus–reward associations and inhibition.

The observation that patients with lesions in prefrontal cortex are impaired in their ability to form and implement self-generated actions, whereas their ability to decide to perform actions elicited by external cues remains relatively unimpaired, is also the starting point of Jordan Grafman and Frank Krueger's contribution. The patient studies they report demonstrate that patients with lesions in prefrontal cortex have particular difficulty with planning problems that extend into the future, and they are impaired at advice taking and using foresight. Furthermore, the authors describe a case study showing that the ability to make rational decisions in personal and social matters may be impaired while general cognitive decision-making abilities remain intact. Grafman and Krueger interpret these findings within a framework based on the assumption that aspects of episodic and semantic knowledge are represented in the form of structured event complexes in prefrontal cortex.

Paul Burgess, Sam Gilbert, Jiro Okuda, and Jon Simons discuss the role of a specific part of prefrontal cortex, the rostral prefrontal cortex, in supporting intentional behavior. They review brain imaging, neurophysiological, and patient studies to suggest that rostral prefrontal cortex acts as a gateway that biases the relative influence of stimulus-oriented and stimulus-independent thought. This account offers an explanation of why patients with lesions in rostral prefrontal cortex have specific difficulties with situations requiring multitasking and carrying out intended actions after a delay.

1.5.5 Part V: Disorders of Volition in Substance Abuse

The last part is dedicated to volitional impairments that give rise to or accompany addiction and substance abuse. The three contributions provide a multifaceted discussion of issues of willpower and self-control and relate closely to the conceptual contributions by Ainslie and by Cohen and Gollwitzer in part 1.

Antoine Bechara argues that the ability to forego immediate rewards to obtain future benefits is the result of a balance between an impulsive system, signaling pain or pleasure of immediate events, and a reflective system, signaling positive or negative future prospects. He suggests that the amygdala provides the neural basis for the first system, whereas orbitofrontal cortex plays an important role in the latter system. Bechara provides empirical evidence from patient studies to support his claim that addiction is characterized by a dysfunctional reflective system, which does not provide necessary control over the impulsive system, as well as a hyperactive impulsive system, which biases the somatic signals associated with immediate prospects.

Michael Sayette addresses issues of self-control by reviewing findings on craving in smokers. He demonstrates that craving is linked to changes in perception and decision making and presents studies suggesting that craving may take different forms depending on individuals' intentions. These findings shed light on the relationship between craving and addiction.

Jay Hull and Laurie Slone discuss volitional impairments that arise as a result of alcohol intoxication. They review findings demonstrating that alcohol affects processes crucial for supporting controlled actions, including conflict detection and conflict resolution. These results inform their dynamic system model of volition, in which disorders are conceptualized as a failure in overriding automatic behavior based on the comparison of an action representation with an internal standard of behavior.

We hope that the collection of contributions in this book will inspire those interested in understanding the processes underlying voluntary action and those striving to explain and treat volitional impairments. The majority of the contributions originate from the talks and discussions at the conference "Disorders of Volition" in Irsee, Germany, in December 2003. A few chapters were invited later to complete the picture emerging from the conference contributions. The conference was made possible by the generous support of the Volkswagen-Stiftung and was part of an interdisciplinary research project on the nature and culture of volition, also funded by the Volkswagen-Stiftung.

Notes

1. In Nazi times, the monastery was a psychiatric hospital and formed part of Nazi Germany's so-called euthanasia program. The ideology behind it was that psychiatric disorders serve as

markers for genetic disorders that are immune to any treatment and threaten the integrity of the gene pool. Through the killing of a vast number of hospitalized psychiatric patients, this program in fact practiced exclusion-to-death (von Cranach 2003). Nowadays, the monastery serves as a center for various scientific conferences, political meetings, and cultural events.

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