

Quantifying Inner Experience?—Kant's Mathematical Principles in the Context of Empirical Psychology

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Abstract: This paper shows why Kant's critique of empirical psychology should not be read as a scathing criticism of quantitative scientific psychology, but has valuable lessons to teach in support of it. By analysing Kant's alleged objections in the light of his critical theory of cognition, it provides a fresh look at the problem of quantifying first-person experiences, such as emotions and sense-perceptions. An in-depth discussion of applying the mathematical principles, which are defined in the *Critique of Pure Reason* as the constitutive conditions for mathematical-numerical experience in general, to inner sense will demonstrate why it is in principle possible to justify a quantitative structure of psychological judgments on the grounds of Kant's critical thinking. In conclusion, it will propose how Kant's critique could be used in a constructive way to develop first steps towards a transcendental foundation of psychological knowledge.

1. Introduction

Psychology has long been aspiring towards establishment as a quantitative science that provides objective measures for psychological phenomena. Yet its subject matter is taken to include individuals' mental states and subjective contents of consciousness, which, as it is often argued, do not qualify for objective quantification. As a historical source of this argument, Kant's famous objection against the 'mathematisability' of empirical psychology is often cited. This paper shows why Kant's critique is not to be read as a scathing criticism of quantitative scientific psychology, but has valuable lessons to teach in support of it. By analysing Kant's alleged objections in the light of his critical theory of cognition, it provides a fresh look at the problem of quantifying first-person experiences, such as emotions and sense perceptions. In conclusion, it will propose how Kant's critique could be used in a constructive way to develop first steps towards a transcendental foundation of psychological knowledge.

For Kant, the problem of quantifiability can be reformulated in terms of the applicability of the *mathematical principles*. According to Kant's central tenet, we have *knowledge of objects*, which is constituted through the *forms of our cognition*, i.e., the forms of sensibility—space and time—and the pure concepts of the understanding, the categories. The guiding question in the *Critique of Pure Reason* (CpR) is: why (and how) do the subject's categories apply to all objects of experience and thus have *objective validity*? In the Transcendental Aesthetic and

in the Transcendental Deduction of the Categories, Kant shows that the categories are necessary conditions of any experience of objects because they provide all our experiential judgments with their *formal determination*, which is explicated (with respect to the constraints of sensibility) in the System of the Principles of Pure Understanding. In particular, the two mathematical principles, based on the categories of quantity and quality, are considered to ground the numerical quantification of experience. However, according to a commonly held interpretation of the *CpR*, Kant's arguments work only for the experience of outer objects in space, which are distinct from the subject that represents them. Kant's strategy fails, so this reading of the *CpR* goes, for inner experience because the transcendental principles, including the mathematical ones, cannot be applied to the products of inner sense.

Does this mean that Kant's theory does not allow for quantification in psychology, the science based on inner experience? Various commentators have drawn this conclusion and, since for Kant the applicability of mathematics is a criterion of scientificity, they have attributed to him a rejection of the possibility of any scientific psychology whatsoever.¹ This view often emerges from considerations of Kant's alleged arguments against the mathematisability of psychology and against the independent observability of inner states, which he presents in the *Metaphysical Foundations of Natural Science (MFNS)*.² In this paper, I rebut this line of argument by showing that the relevant transcendental principles are indeed applicable to inner sense. The aim of this paper is to clarify whether there is a conception of a scientific psychology—a conception different from the one prevailing in Kant's time that was offered by *school metaphysics*—that would be reconcilable with Kant's system of knowledge in the *CpR*.

Kant never offered a systematic account of psychology in the context of his critical philosophy, nor did he provide an extensive study of inner sense and inner experience. We can only reconstruct his views from occasional comments that either directly refer to psychology or that indirectly concern matters of psychology. Most notably, such passages can be found in the *CpR*, for example, in the Transcendental Deduction of the Categories,³ where he distinguishes psychological issues from those issues relevant to transcendental philosophy, in his discussion of rational psychology in the Paralogisms,⁴ and, in the Preface of the *MFNS*,⁵ where he rejects the scientific status of the 'empirical doctrine of the soul'. In the *Anthropology from a Pragmatic Point of View*, Kant also incorporates psychological themes into the new discipline of pragmatic anthropology. In this analysis, I confine myself to Kant's account of *empirical psychology* according to these critical works and do not discuss his criticism of rational psychology or his account of pragmatic anthropology.

The structure of the paper is as follows. Section 2 contains two preliminary clarifications, one on Kant's notion of 'objective cognition' and one on the two senses of 'inner experience'. Section 3 offers an in-depth discussion of the application of the mathematical principles, as constitutive conditions for experience in general, to inner sense. After briefly recalling Kant's allegedly pessimistic comments on mathematisation and observation in psychology in the *MFNS* (3.1),

I discuss the principle of *intensive magnitudes* with respect to inner sensation (3.2). But since, as I argue, this principle is not sufficient to constitute fully fledged empirical quantitative cognition, I subsequently consider the role of *extensive magnitudes* for numerico-conceptual quantification of psychological phenomena (3.3). In section 4, I comment on the sense in which external standards are relevant for the measurability of psychological phenomena. This will reveal the constraints on objectivity that have to be taken into account in psychology. I conclude that it is in principle possible to justify the quantitative structure of psychological knowledge on Kantian grounds because psychological knowledge should be conceived of by analogy with the cognition of physical objects, though with some restrictions on objective validity.

2. Two Preliminary Clarifications

2.1. Objective Cognition as Formal Determination

In the introduction, I have tentatively treated psychology's subject matter as including *individuals'* mental states and *subjective* contents of consciousness. But what exactly does 'subjective' here mean? Prima facie, I take it to denote an individual's set of beliefs, i.e., all those beliefs that belong to one and the same subject. Furthermore, the expression 'subjective contents of consciousness' seems to imply that the particular quality of those beliefs is subjective in the sense of *private*. Subjective contents could be seen as *private* judgments, such as judgments of agreeableness, personal opinions or statements about one's feelings, which cannot as easily be shared with other people as *objective judgments* about external, non-private objects.

Kant's usage of the words 'subjective' and 'objective', as Ralph Walker rightly remarks, is not always unambiguous.⁶ He seems to acknowledge the notions of *individually-subjective* and *privately-subjective*, as defined above, when he distinguishes 'merely subjective' beliefs (such as a particular subject's judgments of pleasure and dislike, feelings and 'judgments of perception', a kind of judgment he repeatedly mentions in the *Prolegomena*) from objective experiences, i.e., experiential judgments (or 'judgments of experience') about objects that conform to our categories.⁷ In the *Critique of Judgment (CJ)*, Kant calls feelings 'subjective sensations' (in the sense of privately-subjective) because they are 'related solely to the subject', and do 'not serve for any cognition'.⁸ Therefore, they are distinct from 'objective sensations', which are 'representation[s] of a thing', and so belong to the receptive faculty of cognition and are necessarily spatiotemporal. Nevertheless, he argues that in each sensation of space there is something 'merely subjective' (e.g., in the sense of the individual's perspective) in addition to the 'material (real)'.⁹

But, importantly, Kant also employs another notion of 'subjective'. The crucial point of the *CpR* is that the categories as subjective forms of cognition are the subject-dependent conditions of any cognition of objects and thus of any

objective cognition. This might sound paradoxical. Yet an explanation can be found in the particular notion of 'subjective', which here refers to the particular *forms* according to which *all human subjects*, i.e., all creatures with our particular kind of sensibility, necessarily structure their experiences. I call this notion *formally-subjective*. These subjective forms are the necessary conditions 'under which alone something can be . . . thought as object in general . . . since without their presupposition nothing is possible as *object of experience*'.¹⁰ They constitute the object of experience with respect to its form: the object is given in space and time, as substance, obeys causal laws, etc. In fact, it is precisely the latter categorial requirements, such as substantiality and causality, that guarantee objectivity. What these formal conditions of the categories amount to with respect to our forms of sensibility, is explicated in the so-called *pure principles of the understanding*.¹¹

But what do these considerations imply for Kant's notion of 'objective'?¹² Although objective cognition depends on the subject's forms of experience, it should nevertheless be independent of a particular subject's content of empirical consciousness. The objectivity of experience is warranted only by the constitutive use of the categories, which Kant claims to have shown to be a priori objectively valid, i.e., necessary and universal, in the Transcendental Deduction.¹³ Given the scope of this paper, I cannot discuss whether Kant's argument for the objective validity of the categories is compelling or not. Here I just indicate certain of Kant's intentions behind his argument. Despite his Copernican turn in epistemology, according to which 'the object must conform to our [the subjects'] cognition'¹⁴ and thus 'representation alone makes possible the object',¹⁵ he wants to defend a notion of empirical truth. For him, there is 'real' or 'material' content of our representations, which cannot be chosen at will by the cogniser, but relies on the *empirical reality*. Our beliefs are either in agreement with this empirical reality, i.e., true, or in disagreement, i.e., false. We find out about the truth-value of a judgment by extracting and comparing the 'material' content of different perceptions of an object. This requires that our perceptions are turned into experiences composed according to particular forms. The material content received from the senses is subsumed under concepts, which can then be compared with each other. Hence, the categories as forms of experience are the *transcendental formal conditions* that make truth-apt judgments as such possible because they constitute the structure on the basis of which material content can be compared.

Yet this is not sufficient to guarantee an empirical reality, as various commentators have objected to Kant's theory.¹⁶ In the Second Edition, Kant therefore explicitly acknowledges that his notion of 'empirical reality' (also called 'objective reality'¹⁷) presupposes what I call the *material condition*, namely the existence of some kind of *external* or *mind-independent 'thing'*, whose existence (or reality) cannot be generated by the mind.¹⁸ In the Refutation of Idealism, added in the Second Edition, Kant argues that experience as such calls for 'the existence of objects in space',¹⁹ i.e., the existence of something mind-independent that affects outer sense and is thus cognised as 'outside us'.²⁰ In the third remark of the

Refutation, Kant even claims that the existence of spatially external objects is a condition of inner experience and thus of the 'possibility of a certain consciousness of ourselves'²¹—an important claim to be discussed later.

In conclusion, Kant's notion of 'objective cognition' requires two conditions, firstly, the formal determination of experience in accordance with the categories, and secondly, the existence of something mind-independent that provides the matter of our sensible representations. This clarification explains the general strategy of this paper. In order to examine whether *psychological* phenomena are quantifiable, we have to assess the applicability of those principles that condition mathematical-numerical thinking to the products of inner sense (3). But due to the material condition, this analysis has to be supplemented by a discussion of the role of external standards in psychological measurements (4). Before starting with this analysis, let us briefly look at Kant's definition of inner experience.

2.2. Two Notions of Inner Experience

For Kant, the notions of 'psychological' and 'psychology' are closely tied to a particular cognitive faculty, namely to *inner sense*, which yields—not only, but mainly—*inner experience*.²² In the Paralogisms, Kant famously characterises (empirical) psychology as the 'physiology of [the objects of] inner sense'—i.e., as the study of nature on the basis of the data provided by the inner sense—in contrast to physics as the 'physiology of the objects of outer sense'.²³ Inner sense is defined as the faculty of the mind 'by means of which the mind intuits itself, or its inner state'.²⁴ Yet it does not provide 'intuition of the soul itself, as an object,' but merely 'intuitions of its inner state'.²⁵ These intuitions are necessarily determined by its form, namely time.

Before I proceed with my reading of Kant's conception of inner experience, I need to refine what I have said about Kant's use of the term 'object', which is particularly ambiguous with respect to inner sense. In the phrase 'object of inner sense' and 'object of inner sensation' it often does not refer to the fully fledged notion of 'object of experience', i.e., an object constituted and determined according to the categories, as indicated above (2.1). Rather, it refers to a *pre- (or semi-)categorical* use of 'object', which I call *object**. The aim of this paper is to clarify how far the *object** of inner sense can be taken to be identical with an 'object of experience'.²⁶ Possible *objects** include *feelings*, such as the feelings of pain or pleasure, which Kant calls 'subjective sensations', as well as *thoughts*, i.e., the making of a judgment at a particular time, *desires*, and *perceptions* mediated through the senses, such as visual or tactile sensations.²⁷

In the *Prolegomena*, Kant explicitly states that *inner experience* is the foundation of psychology.²⁸ A closer analysis of Kant's conception of inner experience suggests that he uses the term in two senses. Firstly, 'inner experience' denotes the 'empirical consciousness of my existence' in time, i.e., the factual having of inner states or the positing of inner states in time, such as the particular occurrence of happy feelings or of a desire for cake.²⁹ I call this first kind (*inner*

experience)*. Kant often uses the term 'inner perception' instead.³⁰ Secondly, in other places, the term refers to empirical judgments about inner states, such as 'Today person A suffers significantly less depressive episodes than before the therapy'.³¹ Those knowledge claims seem to be examples of fully fledged empirical cognitions that according to the categories have quantitative attributes, causal relations, etc. I call them '*categorially cognised inner experience*'. Yet, whilst almost all commentators agree on the fact that Kant legitimately assumes that there is (*inner experience*)*, various scholars deny that on Kantian grounds it is in any way possible that we justifiably speak of *categorially cognised inner experience*.³²

Prima facie, there does not seem to be a reason why the subjective formal conditions of experience, i.e., the categories in the form of the principles of the understanding, should not be applicable to (*inner experience*)*—and indeed, I shall substantiate this claim in what follows. However, the crucial question remains as to whether the subjective-formal conditions of the categories are sufficient to confer *objectivity to psychological judgments*—despite their irreducibly subjective (in the sense of individually- or privately-subjective) contents.

3. Applying the Mathematical Principles to Inner Sense

3.1. Kant on the Problematic Status of Psychology

Kant is aware of the problematic status of psychological knowledge. The most explicit passage on the issue of mathematisability can be found in the *MFNS*. In the Preface, he writes:

Yet the empirical doctrine of the soul must remain even further from the rank of a properly so-called natural science than chemistry. In the first place, because mathematics is not applicable to the phenomena of inner sense and their laws, the only option one would have would be to take the law of continuity in the flux of inner changes into account—which, however, would be an extension of cognition standing to that which mathematics provides for the doctrine of body approximately as the doctrine of the properties of the straight line stands to the whole of geometry. For the pure inner intuition in which the appearances of the soul are supposed to be constructed is time, which has only one dimension.³³

This passage is embedded in a discussion of the criteria of scientificity, one of which is the applicability of mathematics. Here Kant puts forward an argument against the applicability of mathematics to 'the phenomena of inner sense and its laws'. In particular, he argues that mathematics can be applied to inner sense only to a limited extent, namely in form of the law of continuity. This law merely specifies the continuous flux of inner states in consciousness. Kant thinks that, unlike in the case of physics, where geometry provides a huge variety of possible

relations, psychological phenomena are primarily given as events in time, which has only one dimension. Therefore, only an insignificant amount of relations can be established between different psychological phenomena.³⁴ As Sturm and Wunderlich helpfully point out, Kant does not straightforwardly express his own opinion in this passage, but uses the strategy of *reductio ad absurdum*. To that effect, he adopts a *specific* conception of psychology, namely that of Wolff and Baumgarten, who proposed a naive introspectionist view of psychology.³⁵ Kant then shows that, given their account of inner sense, mathematics is not applicable to inner phenomena and concludes that psychology as they conceive it fails as a natural science. In what follows, I show how the application of mathematics to psychological phenomena can be justified with respect to Kant's own theory, in particular his mathematical principles.

3.2. Quantifying Psychological Phenomena I—Intensive Magnitudes and the Real in Sensation

In section 2.1, I have argued that objective cognition according to Kant is guaranteed by the formal determination of experience according to the categories (as well as by reference to an object that induces sensory material). The most basic form of determination is the quantitative or numerical determination of experience, which is accounted for by the two so-called *mathematical principles*, presented in the System of Principles under the headings 'Axioms of Intuition' and 'Anticipations of Perception'. Their function is in fact twofold. On the one hand, they define two types of quantity (which in fact are two aspects of quantity as such, as I shall argue), namely extensive and intensive magnitudes, which are essential to account for the quantitative structure of experience. On the other hand, they justify the possibility of applying mathematics to objects of experience by fleshing out the transcendental, i.e., the categorial and sensible, conditions for constructing mathematical concepts from sensible intuitions. The first principle, discussed in the 'Axioms of Intuition', guarantees that our intuitions are given as extensive, i.e., additive, magnitudes.³⁶ It is based on the idea of a successive synthesis adding unit by unit.³⁷ Therefore, an extensive magnitude (as a whole) is preceded by its homogeneous parts. The second principle, which is contained in the 'Anticipations of Perception', states that the '*real*' in the objects of our sensations, i.e., their qualities, comes in degrees, which can be measured as intensive magnitudes.³⁸ It relies on the synthesis of 'positing the real in time', which fills time with qualities of certain intensities.³⁹ This synthesis is supposed to happen instantaneously at every moment of time, whereby the whole of sensation necessarily precedes its parts (degrees).

As argued in section 2.2, the phenomena investigated in psychology are inner states insofar as they are objects of inner sense, such as thoughts, sensory perceptions of external objects, and feelings of pain or pleasure. Hence, the content of psychology is mainly presented in *inner sensations* arising from the effect of inner states on inner sense. What kind of magnitude is appropriate for

quantifying them? The principle of extensive magnitudes is only applicable to intuitions extended in space or time, i.e., to those representations that occur when the manifold of intuition is taken up in intuition and divided into homogeneous parts that correspond to the spatiotemporal structure. However, if we prescind from the fact that inner sensations are viewed as the matter of intuitions that are conceived of as extended stretches of time, sensations (including inner ones) seem, *prima facie*, instantaneous and indivisible.⁴⁰ Therefore, intensive magnitudes seem to be appropriate quantities for psychological phenomena. The principle of the Anticipations runs as follows:

In all appearances, the real that is an object of sensation has intensive magnitude, that is, a degree.⁴¹

This principle specifies the transcendental condition under which all empirical qualities, i.e., the 'real', given in sensation stand. Kant's phrasing might be misleading for contemporary philosophers, because the 'real' does not refer to the existence of things, i.e., 'reality' in the contemporary sense. Rather, it denotes the positive determinations, or the qualities, of an object in time.⁴² The principle states that each such quality shows a degree that can continuously vary from 100%, i.e., maximum intensity, or full 'reality' in Kant's sense, to 0%, i.e., no intensity and hence, no reality of a certain quality, which Kant calls 'negation'. Thus, if the quality of a sensation has a degree, Kant concludes, it must be possible to think of an 'intermediate sensation' with the same quality of a smaller degree.⁴³ Indeed, we can imagine a continuous sequence of intermediate sensations, with decreasing degrees of quality. From the principle of intensive magnitudes, as Kant construes it here, it can be inferred that an intensive magnitude can be ascribed to the quality of each sensation regardless of its origin in inner or outer sense. However, the principle does not give any clue about how to find appropriate units, scales and fixed points in order to accomplish a determinate quantification and to carry it out by means of empirical instruments. Rather, what it ensures *a priori* is merely that it is *in principle possible* to determine objects of the senses as intensive magnitudes. Hence, Kant seems to offer a principle that guarantees the *mathematical possibility* of assigning intensive magnitudes to objects* of inner sense, though not the empirical feasibility in any particular case.⁴⁴

There are two main objections to the application of the principle of intensive magnitudes to inner sense. Firstly, one could argue that there is no 'real' in inner sensation. This means that inner states cannot be determined as the ground, or the 'cause', of inner sensation and that therefore, there is in fact no real determination of an object to which we can assign an intensive magnitude. This objection is closely related to the argument against the application of the category of substance to inner states, according to which due to the elusive and private character of inner states no permanent substance that bears them can be determined. Secondly, one could object that intensive magnitudes are not amenable to determinate mathematical quantification, because they are not determinate numerical concepts unless they are related to extensive magnitudes. But

such a relation cannot be established for inner states. In what follows, I consider each of the two objections in the context of secondary literature before I present my own reading of the Anticipations. I refute the first objection, but partly concede the second one.

The first objection stating that there is no real in inner sense is often not explicitly brought forward in connection with the Anticipations, but rather with the Analogies of Experience, the principles of relation, particularly the first Analogy, the principle of substance. Béatrice Longuenesse, for example, makes a good case for a close connection between the principle of intensive magnitude and the principles of relation.⁴⁵ Although the matter of the Analogies is too complex to be discussed here, I cannot entirely ignore this issue. Let me briefly outline the argument against a *real object* of inner sense. Kant himself writes in the Anticipations:

Every reality in appearance has therefore intensive magnitude, i.e., a degree. If this reality is viewed as *cause*, either of sensation or of some other reality in appearance, such as alteration, the degree of the reality as *cause* is then entitled a moment, for instance the moment of gravity.⁴⁶

This passage suggests that the real in sensation acts as a *cause* of sensation and thus is conceived of as the real object that affects our senses. The notion of a cause, however, as argued in the Second Analogy, requires the notion of an enduring substance whose states are changing. In the case of inner sense, it might be difficult to define an enduring substance of which one can say that the change of its states causes inner sensations. Inner states that have so far been viewed as the objects* of inner sense are elusive and transient; they fade away as soon as they come into being. For this reason, Michael Wolff calls inner sense merely a 'state sense' ('Zustandssinn') in contrast to an 'object sense' ('Gegenstandssinn').⁴⁷ Dina Emundts, for example, concludes that inner states cannot be determined as objects in accordance with the principles of the understanding and that therefore inner states cannot be possible objects of experience (in the strong sense).⁴⁸ In support of this position, a passage from the *CpR* is often cited in which Kant states that 'the representations of outer sense make up the proper material with which we occupy our mind' and inner sense merely organises 'the time in which we place these representations'.⁴⁹ There does not seem to be any genuine inner sensory material.⁵⁰ In consequence, it is argued, objective inner experience cannot be achieved under any circumstances and, therefore, there is no psychological knowledge in the proper sense. All objects that feature in experience have to be objects of outer sense; only those objects, and as such matter (as the moveable in space), are appropriate entities for the objectifying principles and therefore the only candidates for knowledge. Some commentators, such as Förster, are even convinced that Kant's mathematical principles necessarily depend on his dynamical *theory of matter*.⁵¹ Therefore, the principles are inseparably intertwined with Kant's account of physics, without leaving any conceptual space for the possibility of psychological knowledge.

Interestingly, although various commentators strictly exclude the possibility of a fully synthesised object of inner sense, they grant that something that is given in inner sense, i.e., inner states, has intensive magnitude. Longuenesse, for example, writes with respect to the discussion of the 'empirical theory of the soul' in the *MFNS*:⁵²

Even states of consciousness can thus be considered as 'grounds of multiplicities' [i.e., intensive magnitudes], and therefore in some sense compared as to their magnitude. A representation is 'more or less' according to the multiplicity of representations it inhibits; a very great pain makes one deaf and blind toward any other representation.⁵³

How is this possible then? I do not think that these commentators have another notion of the *real* in sensation than the *real object of experience*, which for them exists only in the case of outer sense. Rather, they seem to propose that intensive magnitudes can also be ascribed to sensations as such. So they apply another formulation of the principle, namely the one given in the First Edition:

In all appearances *sensation*, and the *real* which corresponds to it in the object (*realitas phenomenon*), has an *intensive magnitude*, that is a degree.⁵⁴

Compared to the formulation in the B-Edition, it is indeed unclear whether Kant thinks that sensations as such have an intensive magnitude or whether this principle only applies to the 'real, which corresponds to sensation'. While he still puts sensations and the real of sensation on a par in the First Edition, he amends his phrasing in the Second Edition and does not explicitly acknowledge that sensations are intensive magnitudes. According to the First Edition, it therefore makes sense to say that inner sensations that represent inner states have intensive magnitude, i.e., can have more or less intensity. This may also be the reason why Paul Guyer holds that

intensive magnitudes must be confined to sensation alone, both form *and* reality or matter in the *object* of the sensation being measurable as extensive magnitudes.⁵⁵

But is this a plausible reading of Kant's intention in the Anticipations? The debate about the distinction between sensation and the real that 'corresponds' to sensation is closely related to discussions about Kant's ambiguous use of the term 'sensation'. As Anneliese Maier rightly emphasises in her discussion of the Anticipations, 'sensation' ambiguously refers both to the content of sensation (e.g., qualities of external objects or inner states) as well as to the process of sensing itself (i.e., sensing external objects or self-intuiting). Maier concludes that what can be subsumed under the category of reality can only be the content of sensation.⁵⁶ She convincingly argues that the Anticipations should be read as suggesting a third form of apprehending matter in accordance with the categories of quality and in addition to space and time as forms of sensibility.⁵⁷ The process of sensing is not a spatiotemporal act (as long as it itself is not attended to as object of our senses). Spatiotemporal features as such as well as degrees

of intensities—so is Kant’s message—are first generated by such a process of sensing. Thus, what can be constituted as intensive magnitudes is sensation insofar as it has content. It seems reasonable to conclude that it is the real in sensation only that has intensive magnitude.

In my view, this reading of the Anticipations is highly plausible, particularly in the case of physical properties. If I have the sensation of an object being warm, I assign a certain quantity of ‘heat’ to the object. This quantity is supposed to capture the temperature of the object, but it does not specify any property of *my sensation* of an object having such and such temperature. By stressing the fact that only the ‘real’ in sensation has a degree, Kant ensures that intensive quantities in physics can be measured independently of the sensing observer, and thus he already anticipates an indispensable prerequisite for an objective, quantitative science of physics.

However, in the case of psychology, things are different. While it seems to be straightforward how to distinguish between physical phenomena and the subject’s sensations of these phenomena, it is far less obvious how to distinguish between psychological phenomena and the subject’s sensations of these phenomena. In the case of physical phenomena perceived through outer sense, ‘we represent to ourselves objects outside us’.⁵⁸ We can relate ourselves to these spatially extended objects as co-existent, but distinct from ourselves as perceivers. In the case of psychological phenomena perceived in inner sense, both object and sensation are represented as ‘inside me’. The line between psychological phenomena and the sensations that correspond to them is far less clear.⁵⁹ If we consider the example of the psychological phenomenon of ‘anxiety’, we can imagine a variety of inner sensations that correspond to this phenomenon, for example, feelings of fear, worry and uneasiness, as well as somatic sensations, such as trembling, sweating and heart palpitation, and, in addition, cognitive representations, such as beliefs about suspected dangers.⁶⁰ The problem in ascribing the phenomenon of anxiety to a person is that these sensations, although none of them necessarily occurs in every case of anxiety, are (at least in the form of *dispositions*) an indispensable part of the psychological phenomenon itself. Being anxious means having (the *disposition* to) particular sensations, such as a feeling of worry and the belief that something might go terribly wrong in the near future. It is far from obvious whether these sensations are symptoms that *accompany* the phenomenon or whether they *are* the phenomenon, i.e., the ‘real’ in inner sense.⁶¹ It seems impossible to define the *real* of a psychological phenomenon without referring to the subject’s sensations that accompany it, whereas in the case of physical phenomena it seems reasonable to identify the *real* independently of the subject’s sensations of it, e.g. the real of our sensations of ‘heat’ can be identified with the kinematic energy of the particle movements that result in a particular temperature independently of our sensation.⁶²

Nonetheless, I think we are justified in assuming that there is something real in inner sensation. In my discussion of ‘objectivity’ in section 2.1, I have argued that Kant supports a notion of the ‘real’ as the ‘material’ content of representation, which the cogniser cannot choose at will but necessarily represents as

empirical reality. In this sense, it is plausible to argue that inner states (insofar as they are not products of a volitional, i.e., rational, act) are an empirical reality that cannot be changed at will. For example, a feeling or desire merely occurs and cannot intentionally be induced or abandoned. Hence, there are good reasons to believe that inner sensation contains *genuine* material, which is strictly not reducible to the material of outer sense. This material is brought about by the subject's inner states and should be viewed as representing something real about the subject.

However, if inner sense can have genuine material, this is not to say that inner sensation is completely independent of outer sense. In fact, I shall argue later that inner and outer sense are interrelated and have to work together in every *act of sensation*. As sensible beings we necessarily rely on the fact of being affected through external objects in order to have any material at all to work on. But in the process of dealing with outer affection, a new source of sensory material occurs: *self-affection*, also *self-intuition*, by means of which the mind intuitively itself. On the basis of being affected by inner states, inner sense receives a manifold of inner intuition and thereby generates genuine inner sensations (i.e., sensations that are non-reducible to outer intuition or to mere states of consciousness of outer intuitions).⁶³ Self-affection is not strictly identical with the 'temporalising' function of inner sense, according to which inner sense posits intuitions received through outer sense in time. Those sensations that I call *genuine inner sensations* are representations that do not arise 'through the influence of external things' but 'as effects of inner causes'.⁶⁴ These are the two sources of inner sensations Kant distinguishes in the Transcendental Deduction (A).

One might object to my interpretation of *self-affection* that it makes the whole process of inner sensation unnecessarily complicated and that it even duplicates the 'simple' temporalising task of inner sense. Indeed, I advocate that inner sense serves a double role—it receives inner states by positing them in empirical consciousness in time and it receives the quality of relations between various contents of one's own empirical consciousness. In the former case, inner sense as receptive sensibility 'temporalises' sensations into intuition in cooperation with outer sense. In the latter case, inner sense is determined by the relation of oneself either to a certain object or to other contents of consciousness, i.e., it receives feelings of pleasure and pain as well as desires.⁶⁵ It is precisely through this latter role of inner sense that the determinations of the empirical self in time become available as the 'real' in inner sense to be cognised as intensive magnitudes. Therefore, Kant writes in the *Anthropology* that we cognise ourselves as we appear, namely as the 'object of inner empirical intuition'.⁶⁶ In normal cases of sensation, both tasks are inseparable; inner sense posits both the outer intuitions received through outer sense and the inner intuitions based on self-affection in the subject's temporal consciousness.

Further textual evidence for my reading of inner sense can be found in a passage from the *Anthropology*. There, Kant explicitly distinguishes between two senses, namely between *sensus internus*, *inner sense* in its first role, and *interior sense* (*sensus interior*), inner sense in its role of receiving the feelings of pain or

pleasure, or more precisely, 'the preservation or rejection' of certain ideas or thoughts.⁶⁷ This distinction supports my argument that there are two different purposes of inner sense. In the *CpR*, there are some passages in which Kant explicitly articulates the second, self-intuiting role of inner sense. For example, in the Transcendental Aesthetic (B), he characterises inner sense as

the way in which the mind is affected by its own activity, namely this positing of representation, the way it is affected through itself.⁶⁸

In the Transcendental Deduction (A), as already mentioned, he distinguishes as 'causes' of inner intuitions 'the influence of external things' and the 'effects of inner causes'.⁶⁹ He gives further examples of these 'inner causes' in the Paralogism chapter, e.g., 'thoughts', 'desires', 'feelings, inclinations, or decisions'.⁷⁰

Hence, I find sufficient textual evidence supporting the conclusion that the principle of intensive magnitude is *in principle* applicable to psychological phenomena *insofar as* they are given as the content of *genuine inner sensations*, i.e., sensations that originate from self-affection of the mind by its own inner states. Those inner states can then be taken as the *real determinations of an object** in inner sense. However, so far I have not shown whether these real determinations can be objectively determined as determinations of 'objects of experience' and whether the Anticipations are sufficient for objective quantification.

Before discussing these questions, let me note that my account of inner sense accommodates all notions of 'subjective' mentioned earlier. Inner sense (in its self-intuiting role) as the sense that receives the individual relation between the subject and its contents of consciousness implies the notion of *individually-subjective* contents of consciousness (for a particular subject), which in most cases is not immediately related to external, spatiotemporal objects and therefore also *privately-subjective*. Inner sense in its temporalising function contributes to the *formally-subjective* setup of the mind: all sensory material must be intuited in the form of time and taken up in the subject's temporal consciousness, which eventually makes the representation of objects in objective time possible.

3.3. Quantifying Psychological Phenomena II—Extensive Magnitudes and Numerical Quantification

The second objection to the quantifiability of psychological phenomena by means of intensive magnitudes is that these are not sufficient to establish a numerical determination because they are in fact not fully fledged determinate mathematical quantities. In what follows, I show that, although intensive magnitudes alone are *not* sufficient to assign determinate mathematical quantities to psychological phenomena, it is nevertheless possible to define a determinate quantification of psychological states by appealing to the principle of extensive magnitudes. Let us first look at some of Kant's writings on that matter and then at some comments in secondary literature.

In the *CpR*, we find passages suggesting that Kant thinks that the objects of inner sense can be quantitatively determined. In the Refutation of Idealism, he writes:

It can just as easily be established that the possibility of things as magnitudes, and thus the objective reality of the category of magnitude, can also be exhibited only in outer intuition, and that by means of that alone can it be subsequently also applied to inner sense.⁷¹

Furthermore, he unmistakably states that we are justified to employ 'numerical magnitudes' with respect to both mathematical principles. These principles teach

how in both cases numerical magnitudes and, with them, the determination of the appearance as magnitude, could be used. E.g., I would be able to compose and determine *a priori*, i.e., construct the degree of the sensation of sunlight out of about 200 000 illuminations of the moon.⁷²

Nevertheless, by definition, any numerical representation of a magnitude requires the 'pure *schema of magnitude (quantitatis)*', which

as a concept of the understanding, is *number*, which is a representation that summarizes the successive addition of one (homogeneous) unit to another.⁷³

This definition exactly depicts the features of extensive magnitudes, which likewise result from a successive synthesis of homogenous parts. But what kind of mathematical synthesis is possible in the case of intensive magnitude, which merely relates to *sensation*? In the Anticipations, Kant explains that since sensation 'fills only an instant', an intensive magnitude refers to an instantaneous 'unity in which there is multiplicity' and is thus the product of an 'instantaneous synthesis'.⁷⁴ Kant seems to find a solution for this seeming inconsistency by assuming the possibility of *successively diminishing sensation* from a given reality to negation.

Hence between reality in appearance and negation there is a continuous nexus of many possible intermediate sensations, whose difference from one another is always smaller than the difference between the given one and zero, or complete negation.⁷⁵

In fact, it is the defining feature of intensity that it can gradually disappear and that we can conceive of it as approximating the degree 0 by going through many intermediate intensities (varying by infinitesimally small degrees). This possibility, I shall argue below, is the key to understanding how *numerical concepts* can be assigned to intensive magnitudes on the basis of a successive synthesis in analogy to the synthesis of extensive magnitudes.

A more elaborate discussion of the distinction between intensive and extensive magnitudes can be found in some passages from the *Lectures on Metaphysics*. In various places Kant characterises intensive magnitudes as *magnitudes of the ground* ('Größen des Grundes'), whereas extensive magnitudes are *magnitudes of aggregates* ('Größen des Aggregats'):

Every magnitude (quantity) can be considered [as] either extensive or intensive. The quantity which is represented by the group of that which is contained in the thing is extensive. And the quantity which is represented through the group which is posited through the thing is intensive. Some [things] are quanta because a group of parts is contained in them, and some are quanta through which a group [of parts] is posited as ground. For instance, the illuminative power of a wax candle is greater than that of a tallow candle, for which the first we can read at a distance of 2 feet and with the second only at 1 foot; the former is therefore the ground of a greater effect, the latter the ground of lesser, or better: If I take a kettle and a thimble full of warm water, then the former is extensively greater than the latter, but if the water in the kettle is only lukewarm and that in the thimble is boiling, then the latter is in this case intensively greater than the first.⁷⁶

Let me briefly indicate some commentators' views, before offering my argument for why these passages give us strong reason to believe that intensive magnitudes are incomplete mathematical magnitudes, unless related to extensive magnitudes. Some scholars seem to maintain that intensive magnitudes are independent determinate magnitudes and therefore potential measures of psychological states. According to Guyer, Kant construes intensive magnitude as 'a numerical measure constituted of units which correspond to an instance of a qualitatively similar sensation with some particular intensity but which do not correspond to any actual part of the given sensation'.⁷⁷ Since no actual parts are represented, Guyer has problems explaining what an actual unit of an intensive magnitude could be. Nevertheless, he argues that they are 'numerical comparisons' that describe a more or less of intensity.⁷⁸ He then sidesteps the problem by interpreting the corresponding principle as an empirical claim since, as he argues, it cannot be possible to determine a priori the parts of sensation, as sensation by definition is empirical. For him, the principle is a guideline for finding an actual measure of intensity by searching for *empirico-causally* relations between the intensive magnitude of a sensation and an extensive magnitude.

In an early paper, Thomas Sturm characterises the quantification of mental states by means of intensive magnitude as follows:

Now, this quantitative content of perceptions can indeed be mathematized: briefly put, we can quantify the intensity of a colour experience in that they are ordinally and cardinally measurable (see the example at A179/B221).⁷⁹

In later writings, he is more cautious about this issue and suggests a strongly methodological reading of the Anticipations. He still holds that the Anticipations imply that 'each intensive magnitude is to be conceived as being a place on a continuous scale of its degrees'. However, we should read Kant's comments as 'methodological considerations as to how the measurements are possible', as 'epistemological, not ontological'.⁸⁰ The question of how an intensive magnitude relates to an extensive magnitude can only be meaningfully discussed in the

context of empirical measurement of intensive magnitudes. A quantitative claim about an intensive magnitude of a mental state makes sense only on the basis of an

appropriate external standard, such as relevant physical stimulus or an experimental setup by which to manipulate and control intensive degrees of mental states.⁸¹

Nayak and Sotnak doubt the possibility of measuring intensive magnitudes of psychological phenomena. Although intensive magnitudes can be applied to objects of inner sense, they argue that

it is difficult to see how an intensive magnitude could be mathematized in this way unless it were first correlated with an extensive magnitude. . . . Notice that there may be some causal reciprocity between the two types of measurement.⁸²

In their view, intensive magnitudes are not sufficient for numerical quantification, but have to be empirico-causally related to extensive magnitudes in order to make scientific measurement possible. Unlike Guyer, they hold that we cannot gain objective quantitative psychological judgments without applying the Analogies of Experience, in addition to the principle of extensive magnitude. However, they conclude that in the case of psychology, a mathematisation in the proper sense is not possible because 'the whole range of categorial principles cannot 'get a grip,' as it were, on its subject matter' and so no causal relations can be established.⁸³ A proper mathematisation can only be achieved for objects of outer sense; only intensive *physical* magnitudes can be transformed into extensive *physical* magnitudes.⁸⁴

What can we learn from this debate about Kant's views of intensive psychological magnitudes? In fact, I think that we find adequate textual support for the thesis that Kant construes the Anticipations as a transcendental principle that makes possible the structure of the 'more or less' and constitute intensity as our subjective form of apprehending the real of sensation.⁸⁵ The structure of the 'more or less' itself is *not numerically determinate* without the principle of extensive magnitudes. Consequently, the principle of the Anticipations alone does not allow for numerical comparisons, as Guyer and to some extent Sturm suggest. *Yet* I do *not* argue that intensive magnitudes are quantifiable because they are empirico-causally related to an extensive magnitude. Rather, the principle of intensive magnitude itself involves a 'successive synthesis' that exhibits intensive magnitudes as fractionalised into numerically determined 'degrees'. Only the Anticipations' transcendental dependency on the Axioms' quantitative synthesis makes intensive magnitudes as numerical quantities possible.

Let me explain. For Kant, any quantification necessarily relies on conceptual numerical determinations and thus on the attribution of numbers, which presupposes the principle of extensive magnitude.⁸⁶ The Anticipations as such account for the experience of a 'more or less' structure by appealing to an instantaneous synthesis by means of which the real in sensation is 'apprehended

as a unity'. In this unity, 'multiplicity can only be represented through approximation to negation'.⁸⁷ Unlike sensation, the 'real' in sensation is precisely *not* conceived of as an absolute unity that 'fills only an instance' without multiplicity. Rather, although sensation necessarily provides an indivisible totality, we are bound to represent the 'real' that corresponds to it as having multiplicity, i.e., as having degrees. To account for such a gradual structure of the 'more or less', Kant assumes that sensation can 'gradually disappear'.⁸⁸ Each degree corresponds to a possible intermediate sensation varying from 100% of reality to 0%. The multiplicity of intensive magnitude can only be made explicit by assuming the process of a *continuous successive diminution*. This process should be regarded as a projection onto an extensive magnitude, whereby each 'step' of the diminution, i.e., a particular degree of reality, or a particular difference between two sensations, corresponds to a numerical quantum. In turn, a certain degree of intensity can be represented as generated through (or constituted by) a successive synthesis of adding 'units (of degree)' up to full reality. This projection is thus the basis for defining a continuous *cardinal scale* with a particular unit of degrees. Such a scale first makes possible judgments of the form 'This intensity corresponds to x units of degrees on the scale y '.⁸⁹ For instance, the temperature of 273°K can be 'represented' as an addition of 273 units of °K. Nevertheless, our experience (or sensation) of a certain temperature is always a totality. As Kant rightly remarks, unlike in the case of extensive magnitudes, we cannot perceive absolute numerical values of an intensive magnitude, but only the relative difference between two sensations.

In consequence, intensive magnitudes should be conceived of as *numerical measures of qualities*. Their numerical quantification can be represented only by appealing to the principle of extensive magnitudes and its successive synthesis of *quantitas*, rather than by appealing to a causally connected extensive magnitude. As far as I can see, this argument is fully independent of whether the 'real' corresponding to sensation is given in space or not and thus applies equally to physical and to psychological qualities. It only requires the idea that the 'unity in which is multiplicity' is represented by an inverse successive synthesis that constitutes *quantitas* (or numerical value), i.e., a successive diminution. Since most commentators directly link the debate of intensive magnitudes to causality, they fail to notice that the two mathematical principles are sufficient to justify the mathematisability of psychological qualities. These two principles establish the transcendently-subjective ground for the quantitative structure that underlies the experience of any quality and thus for the applicability of mathematics to inner sense.⁹⁰

However, the mathematical principles do not fully establish the empirical measurability of the objects, i.e., the *physical possibility* of measurement (in contrast to the purely mathematical possibility) insofar as they do not guarantee the objective validity of metrical scales. Such 'material' objectivity can be achieved only if comparisons between different states at different times are accessible to and reproducible by different cognisers. It requires drawing relations between different states—on the basis of the principles of *relation*, to which

I turn in the next section. Interestingly, in terms of empirical measurement, intensive magnitudes mediate between extensive magnitudes (and their quantitative structure) and their application to objects of experience because intensive magnitudes concern perception and thus refer to 'sensibly given matter' (or the real). They provide the 'material ground' for extensive magnitudes by supplying the numerical structure with its sensible-material 'filling'.⁹¹ This is the reason why Kant calls them 'magnitudes of the ground', or 'ground of multiplicities', in contrast to extensive magnitudes as 'magnitudes of aggregates'.⁹² In the *CJ*, Kant puts forward an insightful argument suggesting that empirical measurement always involves numerical concepts, i.e., extensive magnitudes, on the one hand, and a *basic measure*, i.e., a *unit*, that is 'immediately grasped . . . in intuition', on the other hand.⁹³ Although this basic measure itself has to be given as a numerical concept in order to be a 'comparative concept' for other numerical magnitudes, it results from an instantaneous sensation and is thus an intensive magnitude.⁹⁴

In conclusion, this section has shown that both mathematical principles are applicable to inner intuition in a way fully analogous to their applicability to outer intuitions. This applicability establishes the 'mathematical possibility' of mathematically determining inner intuitions, though not the 'physical possibility', or the actual feasibility, of measurement in a fully objective way.

4. Measuring Psychology by External Standards?—A Proposal for the Problem of Objectivity

I therefore acknowledge that a complete foundation of *empirical measurement* is not secured by the mathematical principles. It still lacks a foundation with respect to 'the existence of the objects of a possible empirical intuition'.⁹⁵ Although the principle of intensive magnitude already refers to 'the materials for some object in general', it does so only with respect to its form, i.e., the form of apprehending matter as intensity.⁹⁶ As I have already pointed out, the mathematical principles do not ground the *physico-empirical* possibility of finding *standards of measurement* in empirical research. In the case of inner experience, this means that the units of measurement have to be fixed to an external standard that is in principle recognisable by any individual cogniser. Such a standard, it seems *prima facie*, has to be given as an object in space so that different observers can relate to it from different spatiotemporal perspectives and agree on their judgment about it.

At this stage of my argument, we are confronted with the major problem of empirical psychology, namely the lack of a spatiotemporal object that guarantees the material condition of objectivity. In the *Paralogisms*, Kant argues—in accordance with Hume—that the 'soul' is never given in inner intuition.⁹⁷ Thus, from the mere fact that inner perceptions are given in the constant flux of our empirical consciousness, we cannot derive the existence of an intersubjectively shared, spatiotemporal object of inner experience. In inner sense, we lack a

'standing and abiding self' or a 'substratum', which in analogy to a spatial object could be thought of as a permanent substance.⁹⁸ Various commentators therefore conclude that the principle of substance and the other principles of relation that depend on it, i.e., causation and interaction, are not applicable to inner experience.⁹⁹ Some explicitly infer that the mathematical determination of the 'real in appearance' is possible only if the real is given in *space*.¹⁰⁰ In consequence, scholars have come to agree that inner experiences, and *a fortiori* psychological judgments based on them, are not covered by the arguments for objective cognition given in the *CpR*. They can never be more than 'merely subjective', at best governed by the laws of association.¹⁰¹ In various discussions about 'subjective judgments', commentators are at the most willing to concede some 'indeterminate', non-constitutive application of the categories in them.¹⁰²

In contrast to this 'subjectivist' interpretation, I suggest that, although, insofar as no spatial object is given in them, psychological judgments cannot be justified as 'objectively valid' cognition in the strict sense that is investigated in the *CpR*, they are by no means arbitrary, but require the application of the categories in a way analogical to their application in judgments about physical objects. In what follows, I foreshadow the line of argument I have pursued elsewhere.¹⁰³

At several points of the *CpR*, Kant himself suggests that the cognition of 'myself as an object' is analogous to the cognition of 'other phenomena' in space: I cognise myself, like spatiotemporal objects, 'not as I am . . . but rather as I appear to myself'.¹⁰⁴ I take these passages to indicate an 'as-if' application of the categories in the case of inner experience; i.e., we treat what is given in inner perceptions *as if* it pertains to some object.¹⁰⁵ This object is what is commonly called the 'psychological I', i.e., the 'I' insofar as it is given to oneself in inner perception.¹⁰⁶ This object is construed in accordance with the categories *as if* it were a temporal object to which all empirical properties of oneself represented in inner perceptions were attributed, such as occurrent perceptual states, emotions, and thoughts, as well as long-term moods and standing attitudes. Yet, strictly speaking, this 'as-if' object is never intersubjectively available, or as Longuenesse rightly suggests, the 'psychological I' is not secured as an identifiable object connected to other objects in space and reidentifiable at other times.¹⁰⁷ It is not fully contingent either, but 'fixed' through the real act of thinking, in which a particular cogniser represents himself as the numerically identical subject of cognition, i.e., as the 'logical I' given through the 'I think' by transcendental apperception.¹⁰⁸ Kant states that

the I that I think is to differ from the I that intuits itself . . . and yet be identical with the latter as the same subject.¹⁰⁹

To identify these two ways of referring to oneself would involve a Paralogism, a false equivocation. Yet in the '*I think* [as] an empirical proposition', i.e., in the real act of thinking, the 'I', conceived of as the logical subject of thinking, becomes available as the 'I' that is intuited under the form of inner sense.¹¹⁰ Both the 'logical I' and the 'psychological I' should be viewed as *ways of self-reference*,

though in two different respects, namely in the logical respect as the numerically identical subject and in the psychological respect as the empirical existence in time.¹¹¹

In a further study, this reading of the 'as-if' application of the categories with respect to inner sense and the 'as-if' construction of the 'psychological I' should be justified by a close analysis of the Transcendental Deduction and the Paralogisms, which goes beyond the scope of this paper. Furthermore, with respect to the problem of objectivity, a detailed discussion of the Analogies and of the Refutations of Idealism should explore the possible ways of *relating* inner states with each other and with outer, physical states. This huge issue is controversially discussed in a vast body of literature, mostly focusing on the question of what is necessarily presupposed in Kant's notion of 'objective cognition': the experience of objects in space, or rather the existence of things in themselves.¹¹² By contrast, with respect to psychological knowledge, I envisage a study that casts light on the relevant conception of inner states that is at play in those passages in which Kant argues that 'my existence in time is only determinable through a relation to something that, while bound up with my existence, is *outside me*'.¹¹³

5. Conclusion

The aim of my analysis has been to show that it is possible to justify a quantitative structure of psychological judgments on the basis of Kant's critical writings about inner experience and empirical psychology. I have based my argument on my reading of Kant's account of objective cognition, which is guaranteed by a formal determination of experience in accordance with the transcendental principles as well as by a material condition, which requires something mind-independent that affects the senses. My analysis makes a case for the thesis that the mathematical principles can be applied to inner sense and that they ensure the subjective-formal foundation of quantitative claims in psychology. In particular I have suggested that there is a transcendental relation between intensive and extensive magnitudes, which makes possible the numerical quantification of intensities. Yet a fully fledged objectivity of such claims can only be guaranteed by external, intersubjectively shared standards that have to be spatial. Kant's acknowledgement of the dependence of inner experience on outer experience shows his effort to forestall introspective conceptions of psychology, which deny the importance of external reference points and are at risk of sliding into dogmatic idealism.¹¹⁴ Kant's criticism of psychology in the *MFNS* can thus be seen as directed against those conceptions that exclusively rely on inner sense as privileged source of knowledge about inner states. His discussion of the mathematisability together with his emphasis on the physical standards for inner experience seem to indicate an alternative conception of psychology, namely one that comes close to what came to be called psychophysics (or physiological psychology) in the 19th century. According to Gustav Fechner, the

pioneer of psychophysics, this discipline investigates the functional dependencies between bodily and mental states, and tries to find dependencies between external stimuli and sensations (outer psychophysics) as well as between neuronal activities and sensations (inner psychophysics).¹¹⁵

In the last section, I have suggested that in order to ground the assumption that inner states can be related to external states, one has to presuppose the 'psychological I', the 'I' insofar as it is the object of inner sense, construed as an 'as-if' object of cognition in analogy to spatiotemporal objects and determined through an 'as-if' application of the categories. This proposal has to be specified in further studies. In this connection, it is particularly relevant to discuss the relation between inner states and bodily states, i.e., states of the 'bodily I', which as a spatiotemporal object can be a proper object of cognition. These are matters for further exploration.

In conclusion, if this analysis of Kant's arguments is correct, then Kant's critique of empirical psychology does not reject scientific psychology outright, but reveals the necessary methodological assumptions and the consequent constraints on its subject matter that any such research programme has to concede. This analysis thus develops a first step towards a transcendental foundation of psychology on Kantian grounds.¹¹⁶

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NOTES

¹ E.g., Gouaux 1972: 239; Hudson 1994: 70; Klemme 1996: 236; Makkreel 2003: 150; Schönrich 1991: 134; Mischel 1967.

² MFNS: 471.

³ E.g., CpR: B152-156.

⁴ CpR: A341/B399-A405/B432.

⁵ MFNS: 471.

⁶ Walker 1978: 76.

⁷ Prol.: 298.

⁸ CJ: 206.

⁹ CJ: 189.

¹⁰ CpR: A93/B125-126.

¹¹ CpR: A148-235/B187-294.

¹² Any discussion of Kant's account of objectivity is tied to the enormous and controversial issue of how a realist stance on matters of nature and science can be established within the framework of transcendental idealism. Resolving this problem is at

the heart of Kant's transcendental philosophy. A comprehensive discussion of this issue is not required for my argument and therefore goes beyond the scope of this paper.

¹³ PrL.: 300; CpR: B3-4.

¹⁴ CpR: Bxvi.

¹⁵ CpR: A92/B125.

¹⁶ E.g., Jacobi's famous criticism of Kant's *CpR* (Jacobi 1787).

¹⁷ CpR: A220/B268.

¹⁸ According to Kant, for beings endowed with receptivity, the 'existence' of an object cannot be given through thinking, but only through sensation (cf., CpR: B72; B110; A92/B125; B199; B274).

¹⁹ CpR: B275.

²⁰ CpR: A373.

²¹ CpR: B278.

²² Another important task of inner sense is temporalising outer intuition (or outer experience), which is, however, closely related to inner experience (cf. 3.2).

²³ CpR: A347/B405; A381.

²⁴ CpR: A22-23/B37.

²⁵ CpR: A22-23/B37.

²⁶ Kant seems to invoke a similar distinction in the proof of the Second Analogy. There, Kant distinguishes the object 'insofar as one is conscious of it' (i.e., object*) from the object in the case of appearance 'insofar as they designate an object', i.e., the object of experience (CpR: A189-190/B234-235).

²⁷ E.g., CJ: 206; CpR: A357-358; Progress: 270.

²⁸ Cf. PrL.: 265; also, Anthr.: 134; 141.

²⁹ CpR: Bxl.

³⁰ Cf. CpR: B157.

³¹ CpR: B277; Anthr.: 141.

³² E.g., Strawson 1966; Förster 1987; Friedman 1992; 2003; Klemme 1996: 236; Emundts 2007. See (3.2).

³³ MFNS: 471.

³⁴ Prima facie, the limited amount of mathematical laws does not vindicate a rejection of quantitative inner experience. Wundt, for example, rightly objected to it by arguing that mental events always possess two dimensions; one dimension is time, the other dimension is the quality of sensations, measurable by intensive magnitudes (Wundt 1902: 6). Thus, for any sensation a mathematical representation by a function of two variables is available.

³⁵ Cf. Sturm (2001: 175-6); Sturm and Wunderlich (2010: 60). On the rationalist conception of psychology, cf. Ch. Wolff 1732; 1734; Baumgarten 1739/1779: 15.3-6.

³⁶ CpR: A162/B202-A166/B207.

³⁷ Cf. the definition of number according to the schema of magnitude at CpR: A142/B182.

³⁸ CpR: A166/B207-A176/B218.

³⁹ Longuenesse 1998: 303.

⁴⁰ Cf. CpR: A20/B34.

⁴¹ CpR: B207.

⁴² Kant gives various examples of physical and psychological determinations to illustrate what 'quality of sensation' here means, such as the 'moment of gravity' (i.e., impenetrability), 'warmth' (i.e., temperature), the intensity of light, taste and colours (CpR: A169/B211; A175/B217).

⁴³ CpR: A168/B210.

⁴⁴ Cf. Warren's insightful discussion of 'mathematical possibility' as 'real possibility with respect to the mathematical categories', which is distinct from the 'real possibility with respect to all categories', i.e., the 'physical possibility' (Warren 2001: 18, fn. 26).

⁴⁵ Longuenesse 1998: 302.

⁴⁶ CpR: A168-169/B210, my emphasis.

⁴⁷ Wolff 2006: 267.

⁴⁸ Emundts 2007: 197-199.

⁴⁹ CpR: B67.

⁵⁰ Allison also expresses this view and concludes 'Since inner sense has no manifold of its own, there are no sensible representations through which the self can represent itself to itself as object' (Allison 2004: 279).

⁵¹ This view is most explicitly expressed in Förster 1987, and in more moderate versions in Friedman 1992; 2003; Paton 1935; and Kemp Smith 1930. Förster thinks not only that Kant's System of Principles provides a foundation of physics in the form of a metaphysics of the corporeal nature, as later explicated in the *MFNS*, but also that this metaphysics of physics is necessary to complete the transcendental system.

⁵² *MFNS*: 471.

⁵³ Longuenesse 1998: 320. Also, Emundts 2007: 193.

⁵⁴ CpR: A166.

⁵⁵ Guyer 1987: 199.

⁵⁶ Maier 1930: 56. Also, Cohen's criticism of Kant's ambiguity (Cohen 1885: 433-5).

⁵⁷ Maier 1930: 63.

⁵⁸ CpR: A22/B37.

⁵⁹ Various commentators seem to overlook this problem. Sturm claims that the Anticipations directly state that 'mental states possess different degrees of intensity' (Sturm 2006: 369). This claim, however, does not trivially follow from the principle and thus needs further clarification.

⁶⁰ Cf. Kant on timidity, *Anthr.*: 255-259.

⁶¹ It should be noted here that I assume a strict distinction between the inner state as object* of inner sense, such as anxious feelings, and the object of this state, such as the wild animal as the object of my anxiety. The following discussion considers the first case.

⁶² Sturm and Wunderlich rightly argue that Kant's account of mental phenomena and of empirical consciousness is fundamentally different from present-day accounts of phenomenal consciousness insofar as Kant proposes a cognitive theory of consciousness (Sturm and Wunderlich 2010: 62-3). Accordingly, consciousness is a body of knowledge claims of greater or lesser degrees of clarity. In Kant's conception, the question of *qualia*, i.e., the phenomenal aspect of subjective conscious states, is *not* relevant.

⁶³ Cf. 'the mind is affected by its own activity, namely this positing of its representations, thus the way it is affected through itself' (CpR: B67-68). Furthermore, CpR: A22/B37; B69; B153; *Anthr.*: 140; 153. Also, for example, Mohr 1991: 58-66, Longuenesse 1998: 218-229.

⁶⁴ CpR: A98-99.

⁶⁵ In the CJ, Kant explicitly discusses judgments of taste as those judgments that are based on feelings received in inner sense and determined by the *relation between the subject and its representations*. (CJ: 229). In Cohen's discussion of the Anticipations, he develops a reading of sensation as 'Ausdruck einer Beziehung des Bewusstseins auf seinen Inhalt' (the expression of a relation of consciousness to its content) (Cohen 1885: 433).

⁶⁶ *Anthr.*: 142.

⁶⁷ Anthr.: 153.

⁶⁸ CpR: B67-68.

⁶⁹ CpR: A98-99. In the Transcendental Deduction (B), his account of the figurative synthesis, the *synthesis speciosa*, which is defined as 'the synthetic influence of the understanding on inner sense' (CpR: B154), can be interpreted as the transcendental condition of the empirical act of self-affection, which, however, I cannot discuss here.

⁷⁰ CpR: A357-358.

⁷¹ CpR: B293. Why Kant thinks that the concept of magnitude can only be applied to inner sense if assisted by outer intuition is related to the problem of external standards, as will be briefly indicated in section 4.

⁷² CpR: A178-179/B221-222.

⁷³ CpR: A142/B182.

⁷⁴ CpR: A167-168/B209-210.

⁷⁵ CpR: A168/B210.

⁷⁶ V-MP/Volckmann: 424-425. Also, V-MP/L₂: 562; V-MP/Herder: 22; Refl.: 496.

⁷⁷ Guyer 1987: 184.

⁷⁸ Guyer 1987: 198.

⁷⁹ Sturm 2001: 168.

⁸⁰ Sturm 2006: 369.

⁸¹ Sturm 2006: 371.

⁸² Nayak and Sotnak 1995: 143.

⁸³ Nayak and Sotnak 1995: 143.

⁸⁴ Sturm gives an insightful discussion of their positions and argues—to my mind correctly—that their thesis about the impossibility of a mathematical formulation of causal laws is too strong (Sturm 2001: 168-73).

⁸⁵ CpR: A159/B198; A166/B208; A176/B218. Cf. Maier 1930: 63. Also, Longuenesse and Warren emphasise the transcendental nature of the Anticipations (Longuenesse 1998: 320; Warren 2001: 25).

⁸⁶ Sutherland (2004: 436) provides a convincing argument for this assumption.

⁸⁷ CpR: A168/B210.

⁸⁸ CpR: A168/B210.

⁸⁹ Michell's insightful comparison of Kant's and later accounts of intensive magnitudes shows that for Kant a numerical, *cardinal* scale must always be conceivable for intensive magnitudes, although they are only experienced as *ordinal*. In contrast, according to psychometricians in the nineteenth and twentieth centuries, an intensive magnitude is thought of as 'merely ordinal attribute' without an implicit quantitative structure (Michell 2006: 418-9).

⁹⁰ I think it is mistaken to reject the general applicability of arithmetic to intensive magnitudes of inner sense while acknowledging it for intensive magnitudes of outer sense, as, for example, Pollok (2001: 100) does. Only a few commentators explicitly concede the applicability of the mathematical categories to inner sense, e.g., Beck (1986: 47-8, fn. 35; 56).

⁹¹ Cf. 'A quantum is considered . . . intensively—that which has a quantity insofar as it is a ground' (V-MP/Herder: 22). Also, V-MP/Volckmann: 424-425 (cited above).

⁹² Similarly, Cohen (1885: 423; 428) views intensive quantities as '*quantities of generation*' that provide the *foundation* for—and are thus the prerequisite of—extensive magnitudes. The latter are considered as '*quantities of comparison*'.

⁹³ CJ: 251.

⁹⁴ CJ: 248.

⁹⁵ CpR: A180/B222.

⁹⁶ CpR: A166/B207.

⁹⁷ In the first Paralogism, Kant argues that from the 'constant logical subject of thinking' we cannot infer the 'real subject of inherence' (CpR: A350). Also, CpR: A22-23/B37.

⁹⁸ Cf. CpR: A107; A350; A381; B275; B412.

⁹⁹ E.g., Emundts 2007: 195–197; Nayak and Sotnak 1995: 143. Cf. Analogies of Experience (CpR: A176/B218-A218/B265).

¹⁰⁰ Longuenesse 1998: 320, Warren 2001: 25.

¹⁰¹ This claim is often inferred from section 18 of the Transcendental Deduction (B), in which Kant introduces the 'subjective unity of consciousness' in contrast to the 'objective unity' that is governed by the categories (CpR: B139-40).

¹⁰² Longuenesse 1998: 186; Lee 2012: 235; 268.

¹⁰³ Kraus 2013.

¹⁰⁴ CpR: B155-156. Also, CpR: B68-69; B155; B157; B275.

¹⁰⁵ Cf. Klemme 1996: 229–234, on the 'model of the 'as-if' substance'.

¹⁰⁶ Progress: 270.

¹⁰⁷ Longuenesse 2007: 25.

¹⁰⁸ CpR: B129-130. Cf. Longuenesse 2007: 25.

¹⁰⁹ CpR: B155-156.

¹¹⁰ CpR: B422n. Also, 'I exist as an intelligence that . . . is subject to a limiting condition that it calls inner sense' (CpR: B157-158).

¹¹¹ CpR: Bxxxix-xli(n); also B157; B275; B418.

¹¹² E.g., Guyer 1987; Hanna 2000; Allison 2004; Dicker 2008; Chignell 2010.

¹¹³ CpR: Bxl.

¹¹⁴ CpR: B128; A372; A377. I agree with Sturm that Kant absolutely disapproves of such conceptions (Sturm 2001, 2009).

¹¹⁵ Fechner 1860: I, 8.

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Abbreviations

In citing Kant's text, the following abbreviations are used:

Anthr.	Anthropology from a Pragmatic Point of View (Ak., vol. 7)
CpR	Critique of Pure Reason (Ak., vol. 3-4)
CJ	Critique of Judgment (Ak., vol. 5)
MFNS	Metaphysical Foundations of Natural Science (Ak., vol. 4)
	ProgressWhat real progress has metaphysics made in Germany since the time of Leibniz and Wolff? (Ak., vol. 20)
Prol.	Prolegomena to any future metaphysics that will be able to come forward as a science (Ak., vol. 4)
Refl.	Reflections (Ak., vols. 14-19)
V-MP/Herder	Metaphysics Herder (1762-64) (Ak., vol. 28)
V-MP/L ₂	Metaphysics L ₂ (1790-1791) (Ak., vol. 28)
V-MP/Volckmann	Metaphysics Volckmann (1784-85) (Ak., vol. 28)

All references are according to *Kants gesammelte Schriften*, edited by the *Königlich Preussischen Akademie der Wissenschaften*, 29 vols., (Berlin: de Gruyter, 1902–). I usually provide the *Akademie* page number. With respect to CpR, I employ the standard A/B pagination. Translations are according to the Cambridge Edition of the Works of Immanuel Kant, edited by P. Guyer and A. Wood.

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