An Introduction to the Logic of Psychological Measurement

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Contents

Preface

Plato suggests in his *Sophist* that corresponding to each productive activity there is a form of sophistry, a pretence or imitation of that activity. If measurement is the assessment of quantity then S.S.Stevens' famous definition of it as "the assignment of numerals to objects or events according to rule" is an incitement to sophistry if ever there was one and the practices called "psychological measurement," which presently lean heavily upon Stevens' definition for legitimation, are, perhaps, nothing more than a pretense.

It would be harsh, indeed, to dismiss such practices simply because a doubt has been raised. Science needs speculation as much as it needs criticism. However, a doubt raised lives until resolved, and doubt about the status of quantitative practices in psychology has a long history. If measurement is the assessment of quantity then there is only one way to resolve this doubt and that is by showing that the psychological variables involved actually are quantitative and that the procedures which psychologists use in the hope of measuring them enable quantitative relations between their values to be assessed. This book addresses the first of these issues.

To show that a variable is quantitative is to show that it has a definite kind of structure: its values stand in ordinal and additive relations to one another. This does not mean, as the physicist and philosopher N.R.Campbell mistakenly thought, finding empirical analogues of numerical addition. However, it does mean finding evidence in favor of underlying additive structure. How that may be done in psychology is now becoming clearer, thanks largely to the work of R.D.Luce and his associates on the theory of conjoint measurement. As Richard Feynman stressed in his lectures on physics, "whether or not a thing is measurable is not something to be decided *a priori* by thought alone, but something to be

decided only by experiment." The theory of conjoint measurement lights the way to the relevant experiments.

Although expositions of the theory of conjoint measurement have been in the literature for more than a quarter of a century, the thinking of psychologists about their quantitative practices has not been greatly changed (outside of psychophysics, that is). There are two reasons for this. One is that expositions of this theory have been highly technically mathematical. Most psychologists are not trained as mathematicians and so this literature is largely inaccessible to them. However, the essential features of the theory can be understood with only a minimal mathematical background (i.e., high school algebra). Therefore, I have sought to provide what is for the most part a non-technical introduction. The second reason is that the radical implications of this theory have not been expounded by its originators. They have remained within the confines of the representational theory of measurement, a theory which I regard as false. The theory of conjoint measurement shows how non-extensive forms of measurement can be incorporated within a single, neo-traditional conception, one which has number as part of the empirical realm. In this book I have sought to present conjoint measurement as part of such a theory, one consonant with the development of quantitative science and consonant with an empirical realist theory of number. According to such a theory the distinction between the quantitative and the non-quantitative is absolute and empirical, and so the issue of where psychological variables fall becomes explicit.

This book is written as a text for a one semester course introducing students to the foundational issues involved in psychological measurement. It is not intended to compete with traditional textbooks on psychometrics, but rather to supplement them, by bringing to students in a critical way some of the recent advances made in our understanding of measurement by theorists such as S.S.Stevens, P.Suppes and R.D.Luce. It is not possible to have a balanced perspective on the practice of psychological measurement without exposure to this foundational material.

In undertaking this book I was stimulated, encouraged and constructively criticized by many people, to all of whom I extend my gratitude. I make special mention of J.P.Sutcliffe, who, as teacher introduced me to the issues surrounding measurement, and as supervisor and later as colleague, encouraged me to inquire into these issues; of G.W.Oliphant and L.Stankov, who commented valuably upon earlier versions of various chapters; of J.R.Maze, who expounded a version of Anderson's empirical realism which I came to accept as a vantage point from which to view psychology generally and measurement theory in particular; of D.M.Armstrong, who encouraged me to believe that the empirical realist account of number and quantity is not as outrageous as many adjudge it to be; and of R.D.Luce, whose writings on measurement theory inspired my vision. Over many years of teaching this kind of material to undergraduate, honours year and postgraduate students, I have been privileged to know many perspicacious minds, from whom I have learnt much. Without naming them I wish nonetheless to thank

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