

AUTISM

THE MOVEMENT-SENSING PERSPECTIVE



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Preface to Section III

First Things First—Let Us Get the Math Right

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Science follows the path of intuitive exploration—an endeavor to find answers to the unknown. Guided by, and founded upon, the use of mathematics, science tests and confirms the conjectures of creative scientific thinking, resulting in a corpus of collective knowledge that has been robustly examined and can be reproduced by a community following the scientific method. This scientific method is thus based on the systematic collection and scrutiny of empirical evidence attained through precise measurement. As such, the means employed to measure phenomena are as important as the methods used for analysis. Choosing an inappropriate mathematical framework to analyze our data or overconstraining the way in which data are gathered or measured can often derail the path of scientific inquiry. Constrained methodology and/or inappropriate methods of analysis are often reflected in a constrained, dogmatic one-sided view of a phenomenology that is ungeneralizable to the broader context—an inherent feature of the replication crisis now facing psychology (Francis 2012a, 2012b, 2012c, 2012d and see Chapter 11). This crisis has had a profound effect on the academic field of inquiry at large, leading to increased scrutiny and questioning of methodologies employed. Yet more importantly, this epidemic implies that psychological results are not conducive to generalizable knowledge that may benefit humanity at large—that is, they are unlikely to build toward lawlike findings that we can trust as general rules to integrate into the foundations for further inquiry. Indeed, building a core foundational corpus of knowledge to spawn further scientific inquiry and discovery is at the heart of the scientific method. Thus, modes of inquiry, the methods of data gathering, and analysis techniques in fields that deal with mental health and psychological phenomena, including those within a clinical setting, are arguably more an art than a science—as defined by the scientific method. This section aims to expose some of the issues that we need to address in the specific field of autism spectrum disorder (ASD) research if we are to make progress in posing proper lines of inquiry to begin defining the phenomena surrounding this constellation of disorders. Drawing on mathematical principles, these chapters aim to illustrate the importance of the concrete application of sound instrumentation to measure phenomena at all levels—including complex human behaviors. Methods to analyze and scrutinize data that can be applied within this broad context will be introduced in an attempt to showcase how the field can move toward applications that can invariably hold stable across different cultures and historical time periods for generalizable, replicable data.

Chapter 10 provides an overview of statistical considerations that should be made prior to choosing a framework for analyses. Chapter 11 provides concrete examples of inappropriate use of statistical methods. Chapter 12 then provides examples of this process when working with data collected from a group of individuals with ASD. This chapter discusses and illustrates these methods drawing contrasts with existing paradigms within the field of psychology and psychiatry—demonstrating known difficulties inherent with these fields, including the replication crisis (also discussed in Chapter 10), impeding generalizability (e.g., Gallistel 2009; Nickerson 2000).

Chapter 12 also provides an account of contemporary problems with data analyses owing to the complexities inherent in sensory-motor processes present in different “behaviors.” The chapter discusses the inadequacy of current assumptions and analytical approaches to formulate problems and possible solutions in ASD behavioral analyses. Chapter 13 provides examples of new data types across different scales of noise-to-signal ratio that allow us to “zoom in and out” of the phenomena using different “lenses” and alternate between analytical formulations that simulate phenomena in a synthetic arena and hypotheses that are directly tested in the empirical arena. This chapter closes with an example of new methods to intervene in ASD while respecting the child’s will and rights to spontaneous self-exploration and self-discovery.

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