Mikael Heimann

Imitation from Infancy Through Early Childhood

Typical and Atypical Development

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In memory of
Tomas Tjus
best friend and colleague

I know it looks like I'm moving but I'm standing still

Bob Dylan (1997) "It's not dark yet" © Special Rider Music Printed by permission of Sony Music Publishing Scandinavia / Notfabriken Music Publishing AB

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To my children and grandchildren, I would like to say that life is bigger than research, and family is most important (don't laugh, I'm serious, although I suspect that some of you have a hard time believing me).

Thanks also to Jolo, my dachshund. Many ideas came as we took our daily walks.

Katarina! Thanks for giving me the space to write this book. I promise to be better tending to everyday matters. Getting the garden in order, growing potatoes. Your love means everything to me!

Contents

About the Author

Mikael Heimann (PhD 1988, Pennsylvania State University, USA) is Emeritus Professor of Developmental Psychology at Linköping University, Sweden. He has a background in child clinical psychology and has also been a professor and head of the Centre of Child and Adolescent Mental Health, University of Bergen. Dr. Heimann's research focuses on infant cognition (imitation, memory, and attention) and early social and communicative skills in both neurotypical and neurodiverse children. He has also conducted intervention studies aimed at increasing social interaction skills and literacy for several neurodiverse children.

Chapter 1
Prologue

Abstract This introductory chapter outlines the rationale of the book and provides an overview of the different sections and chapters. Furthermore, the chapter gives my personal motivation for the book: going back to my work as a clinical child psychologist in Sweden in the 1970s. Imitation is a key concept throughout the book, and it is used as a vehicle for understanding early memory, social communication, and language development as well as a vehicle for change. Different views on imitation, mimicry and emulation will also be presented. This is important since the word "imitation" is used in many different ways and given different meanings in the literature. There are huge differences between different researchers as well as between academics and lay people (e.g., parents).

> Children are especially sensitive to information they obtain from others, both in their everyday observation and imitation of actions and in learning from testimony (Gopnik, 2020, p. 4).

Our understanding of the newborn period has changed dramatically over the last 40–50 years; we no longer view the newborn infant as a blank slate. Today most of us assume that we are born with abilities that help us adapt to the extra uterine social environment. These abilities help the newborn to be treated as a social and interesting human being already from the beginning and also guide early development by making some stimuli more attractive or salient than others. Although there is no consensus in the literature as to which psychological abilities exist at birth, a consensus exists for the overall idea that a newborn child has essential capacities to his or her disposal right from the start. In my view, some of the important early capacities are the newborn child's attraction to face-like stimuli and to language-like sounds and the ability to imitate facial gestures. On a more general level, processes like perceptual narrowing and associative learning also drive early development and learning. But proving that a specific ability exists in a newborn, e.g., newborn imitation, is one thing; understanding the details of such an early capacity is a different endeavor.

In 1981, when I collected the data for my first study on imitation, I worked as a clinical psychologist at a child psychiatric clinic in Gothenburg, Sweden. The theories used for understanding early child development within the clinic were at that time still heavily influenced by classic psychoanalytic theory. Concepts like the oral

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and anal stage were used to describe the motivation of the infant during the first years of life. The newborn infant was seen as utterly helpless with almost no abilities to cope with the world outside the womb. Mahler's description of the newborn as autistic also affected how the neonate was viewed (Mahler et al., 1975). The fact that researchers within pediatrics, developmental psychology, and related fields already at that time had begun to describe the infant as competent (see, for example, Stone et al., 1973) had not yet had any strong impact on the prevailing clinical theories (at least not at the clinic where I was working). However, my thinking changed in 1977 when I stumbled upon Meltzoff and Moore's seminal paper claiming that 2- to 3-week old neonates imitated facial gestures such as mouth opening, tongue protrusion, and lip pouting. To me, this was a turning point[1] in how to understand the abilities we bring with us into this world as newborns. If these findings (see also Dunkeld, 1979) could be sustained and replicated, then both developmental and clinical theories used at the time had to be rewritten. And this book follows one thread of studies that this turning point set in motion in me, studies that focus on early socio-cognitive development, memory, and clinical interventions, the common denominator being imitation and that they have been conducted in Sweden (almost all) and in Norway (a few).

Loosely speaking, one can say that the debate today focuses on the relative importance of development and learning in comparison with how much inbuilt algorithms or modules explain early capacities. How "core" is the idea of core knowledge, and how does it differ from the idea of "starting state nativism"? Are our socio-cognitive capacities just predesigned Lego blocks waiting for the right time to be activated, or is our modular mind formed through dynamic processes (e.g., Karmiloff-Smith, 2009), continuous interplay, and interaction between biology (starting with genes, cell development, proliferation, and metabolism) and environment (nutrition, opportunities to learn, quality of the early relationship)? Or are most of our early capacities developed through experience and associative learning processes (e.g., Heyes, 2016)?

However, strong views do exist regarding some of the early capabilities. One of the most controversial proposed abilities is neonatal imitation, a central focus of this book, and there is a real risk that some of my colleagues will stop reading right here since, in their view, neonatal imitation is a nonproven (e.g., Leys, 2020) or even non-existing ability (e.g., Heyes, 2016; Oostenbroek et al., 2016). I will touch some more on this debate later in the book (see Chaps. 2, 3 and 10) but will not dwell on it at this point even if it will be clear that my interpretation of the field differs from those claiming that neonatal imitation does not exist.

My goal is to present the research that has been carried out primarily in Sweden by me and my colleagues since the early 1980s. The aim is to summarize both previously published and unpublished findings and present them in such a way that the

[1] To be honest there were several other turning points in the 1970s such as Ed Tronick's still face experiments (Tronick et al., 1978) and Colwyn Trevarthen's empirical-based theory on primary intersubjectivity (Trevarthen, 1979). However, for me, the observations on neonatal imitation was the information I needed in order to leave clinical work for research.

reader can make an informed evaluation of the data and reach an independent conclusion. The studies will cover not only imitation in the perinatal, neonatal, and infant period but also longitudinal observations (Chaps. 4 and 5), imitation as a memory measure (Chaps. 6 and 7), and imitation in children with autism (Chaps. 3, 8, and 9) and children with Down syndrome (Chap. 3). Imitation will be treated as having many facets, cognitive, social, relational, and also as an intervention method for children with autism. The work summarized in this book is inspired by many other colleagues, their theories, and their empirical work, and I hope that the text will clarify on whose back I am standing as you read along.

The starting point is the newborn child and an ability that recently has become most controversial: neonatal imitation. Still today, more than 40 years after Meltzoff and Moore's publication in Science,[2] the phenomenon is highly debated. The key issues being (1) if it is a capacity that truly exists at birth and (2), if observed, is it actually imitation or does the responses viewed to be imitative reflect other types psychological or biological processes? It might look like imitation, but is it really true imitation?[3] How we answer these seemingly benign questions impacts how we define the psychological starting state of the newborn child. It will inform us about the core of our human nature and to what degree "imitation" is learnt or not.

The word "imitation" will naturally be quite recurrent in the pages of this book. Its meaning feels obvious to many of us, but in reality, the word has many uses and meanings within many areas and disciplines. I will not try to sort this out in my writings but will try to be as specific as possible in defining how I use the word. To start with, however, it might be interesting to have a glance at how the word is used and defined by the Oxford English Dictionary (OED). In the OED the word imitation is categorized in band five (out of eight) when it comes to its current use in English (accessed July 12, 2020):[4] "Band 5 contains words which occur between 1 and 10 times per million words in typical modern English usage. These tend to be restricted to literate vocabulary associated with educated discourse, although such words may still be familiar within the context of that discourse… Most words which would be seen as distinctively educated, while not being abstruse, technical, or jargon, are found in this band."

The OED lists seven different areas where the word imitation is relevant. Psychology, literature, and music are but three of them. The definition attached to psychology[5] reads "The adoption, whether conscious or not, during a learning process, of the behaviour or attitudes of some specific person or model." The first

[2] But note that observations suggesting an imitative capacity within the first 4 to 6 weeks of life had been around long before Meltzoff and Moore's publication of their experiment. See, for example, Maratos (1973, 1982), Gardner and Gardner (1970) or Zazzo (1957).

[3] True imitation is a complex concept but seems to indicate that real imitation only exists when the child has some kind of reflective awareness combined with an intention to respond (e.g., Tomasello, 2016).

[4] https://public-oed-com.e.bibl.liu.se/how-to-use-the-oed/key-to-frequency/

[5] OED, 2nd edition. The entry imitation had not yet been revised in the third edition of OED at the time when I accessed the dictionary.

general reference to the word in the English language, according to OED, goes back to the year 1504, while the earliest references for the usage within psychology come from a considerable later source. Here James Baldwin's book from 1895, *Mental Development in the Child and the Race*, is used. Five more references are listed within the psychology paragraph of which one comes from the English translation from French of Gabriel Tarde's book *The Laws of Imitation*. This definition reads "By imitation, I mean every impression of an inter-psychical photography…willed or not willed, passive or active."

Tarde was a French sociologist who developed a theory aiming to explain the forces that shapes society. Imitation is in his theory seen as a mechanism for societal development. It is through imitation that inventions and discoveries are spread (Tarde, 2013).[6] According to Diellal and Gallouj (2014), Tarde's society "is made up of individuals who resemble each other because they imitate…each other" (Diellal & Gallouj, 2014, p. 2). Tarde does not see imitation as mechanical; rather, imitation is a vehicle for change as it leads to variation. Tarde's view also resonates well with more contemporary work by pointing out that imitation can be exact, partial, conscious, unconscious, voluntary, or involuntary. It is by imitation that we become part of society which, to me, is another way of saying that it is partly through imitation that we become cultural beings.

In psychology an imitative behavior is often divided into several categories such as mimicry, imitation, emulation, and mimesis. They are then defined according to various aspects, for example, intention, rational inference, cognition, culture, or evolution. There are no clear boundaries, but I bring this up since the way I use imitation in this book encapsulates processes that by some would be defined as mimicry and maybe even emulation or mimesis. In other words, imitation as used here is an overarching term. Another possibility would have been to use the terminology suggested by Merlin Donald (1991, 2005) who argues that our mimetic capacity that evolved millions of years ago formed the basis for our cultural development. Culture came first in the evolution of our species, language second. "Mimesis is an umbrella term that includes imitation and mimicry" according to Donald (2005, p. 286). Mimicry, in Donald's sense, occurs when an act is reduplicated without considering the purpose of the action, imitation when the imitator pays attention to the purpose of the act. Imitation is also, in comparison with mimicry, more flexible. Mimesis then is a "reduplication of an event for communicative purposes" (Donald, 2005, p. 286), and he mentions children's fantasy play as an early example. Donald's theory aims to explain the slow evolutionary process that took us from a non-symbolic culture to the highly symbolic and linguistic culture we are living in today. It all started with mimetic communication and non-linguistic symbolism. Still I keep my usage of the term imitation since even in Donald's descriptions, there are no strict demarcation lines between the various concepts: "There are no discrete boundaries separating these levels of mimetic action

[6] The book, *Les lois de l'imitation* (The Laws of Imitation), was originally published in 1890.

[mimicry, imitation, and mimesis]…This is a sliding, rather than discrete, scale that varies with the depth of cognitive processing…" (Donald, 2005, p. 287).

However, the main theme of this book is not cultural learning, so let us end this introduction by going back to the starting point. The continuous discussion – or maybe I should say fight – and the strong disagreements between experts on how to understand the capacity of the neonate are important and will hopefully propel us forward in our understanding. People take strong stands (and that goes for me too, at least sometimes) for their theoretical positions: Yes, this is a phenomenon the newborn is capable of, no this is just something looking similar to a more advanced capability, or no it should just be considered a fake conclusion (the method does not hold up or the phenomenon is just an artifact). Strong views are important in order to sharpen our analysis, methodologies, and theories. But strong views also increase the risk of the fallacy of the *argumentum ad consequentiam*. That is, that we conclude that something is true just because we like the consequences. A risk no one is immune against. Thus, it also affects me as I write this book although I hope with as little effect as possible. I believe the evidence does talk in favor of my position, but I am aware of the fact that the final piece of the puzzle is still to be found. As the evidence piles up, we will eventually be able to form a common truth.[7]

Besides this prologue, the book contains eight chapters organized in three sections plus one final closing chapter (Chap. 10) with the aim to also look ahead. The first section (From the Social Infant to the Verbal Child: Insights from Imitation) includes four chapters (Chaps. 2, 3, 4, and 5) that describe the imitative abilities I have observed at birth, in infancy, and over the first years. This section also discusses the origin of imitation in children with autism and Down syndrome. Finally, a hitherto unpublished study on the development of various forms of imitation from 9 to 36 months of age is presented as is a comment on the possibility that temperament explains part of the observed variation in imitation. The second section (Memory and Imitation in Infancy) includes Chaps. 6 and 7 of which the first discusses deferred imitation as a memory measure and how it predicts later communication and language skills. This chapter also includes observations on how electrophysiological indices of learning might relate to behavioral data. The second chapter in this section investigates to what degree infants use rational inferential processes when deciding how they respond to a specific deferred imitation task. The last and final section (Imitation: A Vehicle for Change for Autism) is devoted to children with autism and the role imitation might have for understanding their condition. The first chapter in this section, Chap. 8, includes a brief historical account but focuses thereafter on the issue whether imitation constitutes a unique problem for children with autism. Chapter 9 presents a series of studies using a "being imitated" strategy to investigate to what degree this approach has the power to increase autistic children's social motivation or interest.

[7] Maybe a total agreement is too much to hope for. Even evolution, a theory with all facts speaking for it, is still debated among some groups (see Dawkins, 2009).

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Part I
From the Social Infant to the Verbal Child: Insights from Imitation

Chapter 2
A Fresh Look on Neonatal Imitation

Abstract This chapter summarizes my work on neonatal imitation in typical infants. The first part discusses the complexity behind studying neonatal imitation and the various interpretations of the phenomenon that exists. This section is a description of my take on the state of the art of the field as of today while also acknowledging the controversy among the findings that exist. The chapter then presents findings from three Swedish studies providing support for (1) imitation during the perinatal and neonatal period, (2) the existence of individual differences in imitation observable already during the neonatal period, and (3) observations on the stability of imitation from the neonatal period to infant imitation at the age of 3 months. Theoretically, this chapter touches on associative learning, intermodal matching (starting-state nativism), and the role of mirror neurons.

> Most remarkably, before a baby has competence for handling and exploring non-living objects, he or she shows sensitive awareness of the motive states and feelings of other persons who offer to interact in well-timed contingency with what the infants expresses, and the baby reacts in intricately adaptive interpersonal ways to human expressions, often imitating, but not just by imitating... (Trevarthen & Aitken, 2003, p. 112).

Is There a Capacity to Imitate at Birth?

Is it really possible for a newborn child to imitate? This question highlights a core psychological dilemma: How do we learn about the world, and what skills, if any, are we born with that might guide the neonate towards relevant (read: social) stimuli. To some, this question might seem outdated since many textbooks as well as information given to parents and professionals within well-baby clinics often treat newborn imitation as a real phenomenon. This has been the case for decades, ever since initial anecdotes, single case observations and, subsequently, by important and stringent experimental studies published since the seventies. The experimental findings were especially convincing to many of us.[1] However, recently an increasing

[1] I am aware of the intense debate around the phenomenon that flourished in the late 1970s and early 1980s, but it would need a separate chapter to discuss all aspects of that discussion. Parts will be mentioned later, but my main focus will be on the recent debate.

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number of researchers have claimed that neonatal imitation is in fact not "real" imitation but a phenomenon that can be explained either as an artifact or through nonimitative processes (views that I will come back to later in the chapter). This perspective can be seen as a revival of Piaget's (1962) original view where he states in his opening paragraph on imitation that "The child learns to imitate…" (p. 5).

The reason why newborn imitation is of such interest and still creates debate and controversy has to do with the idea of what constitutes our starting state, what kind of capacities do we bring with us into this life, and what capacities need postnatal time and learning to emerge. In short, how we understand a newborn child's behavioral and cognitive capacities has a direct impact on our psychological theories of how the mind is formed and develops. Thus, it is no wonder that neonatal imitation has been – and is – an area of controversy. Even if observations claiming that neonates can imitate have been around for a long time (see for instance, Gardner & Gardner, 1970 or Zazzo, 1957), it was not until the 1970s that robust systematic observations and experimental data were presented for the first time. It was during this period that Maratos (1973), Dunkeld (1979), and Meltzoff and Moore (1977) reported that infants 1 month old or younger were able to imitate facial gestures like mouth opening and tongue protrusion.

These early findings stirred up the scientific community since they did not fit the general view of what a newborn was capable of at the time.[2] It motivated the launch of several studies resulting both in confirming reports (e.g., Field et al., 1982; Heimann & Schaller, 1985; Kugiumutzakis, 1998; Meltzoff & Moore, 1983a, 1989; Vinter, 1986) and in studies reporting failures to replicate (e.g., Anisfeld, 1991; Abravanel & Sigafoos, 1984; Hayes & Watson, 1981; Koepke et al., 1983). In recent years, the debate has once again intensified, as exemplified by theories on associative learning suggesting that imitation is a learnt ability (Heyes, 2016) that can be explained as an orofacial stereotype (Keven & Akins, 2017), by experimental studies claiming no substantial evidence of neonatal imitation (Oostenbroek et al., 2016), and by a theoretical review suggesting that it might just be an illusory phenomenon (Leys, 2020). Of particular interest is a recent meta-analysis (Davis et al., 2021) suggesting that the contradictory findings might be due to the "the overall positive result is an artifact of high researcher degrees of freedom" (p. 1).[3] Views that contrast with other recent work reporting positive findings in infants born at term (Heimann & Tjus, 2019; Nagy et al., 2020), in very preterm infants (Koenig-Zores et al., 2021), and among non-human primates (Dettmer et al., 2016; Ferrari et al., 2012). It also contradicts the conclusion provided by a relatively recent review (Simpson et al., 2014). Nagy and Molnar (2004) have also demonstrated that babies only a couple of hours old react to communication disturbances and that infants use their imitative capacity as a means to communicate. Thus, the newborn

[2] The dominating theory on the role of imitation was Piaget's (1951/1962) theory. He held that imitative-like responses at birth or shortly thereafter were best categorized as pseudo-imitation. Of more importance to what is presented in this chapter, he claimed that a newborn child was incapable of any imitation that required comparison across two or more senses.

[3] See Chap. 10 for some more thoughts regarding the current debate.