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The first perverse *Review. Pasquale Penta and his pioneering studies on sexual psychopathy*

Lorenzo Leporiere*

Abstract: In 1896, in a very bigoted and puritan Italy, the psychiatrist and criminal anthropologist Pasquale Penta launched the "Archivio delle psicopatie sessuali", the world's first Review to directly address sexual deviance. Its purpose was to promote scientific understanding of sexuality, especially its pathological forms. Despite the unique nature of the journal and the more than satisfactory sales, it ceased publication after only one year. No official explanation was given. This article will retrace the path that led Penta to establish the Review and to identify possible reasons for the interruption of his pioneering venture.

Keywords: Pasquale Penta, "Archivio delle psicopatie sessuali", Sexual Perversions.

1. *Towards a science of sexuality*

The historian Peter Gay has defined the nineteenth century as "restless"[1], marked by ambivalent forces: on the one hand, Victorian puritanism and bourgeois respectability which made it one of the most sexually repressive periods in history, and on the other hand, non-conformist and libertarian approaches. As for the former, the biographer and writer Stefan Zweig already noted that, in the nineteenth century, many people chose to ignore the thorny issue of sexuality:

Art, science, morality, the family, the Church, the school, and the university were all given the same marching orders. There was to be no parleying with the enemy, who must never be met in open fight, but invariably circumvented. There was to be no discussion, no argumentation; the adversary must be fought by silence, by boycotting and ignoring him [2].

But the nineteenth century is also the century that romanticizes science, a science now called upon to penetrate all the mysteries of human existence,

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1 Peter Gay, *Schnitzler's Century: The Making of Middle-Class Culture 1815–1914*, Norton, New York 2001.

2 Stefan Zweig, *Mental Healers: Franz Anton Mesmer, Mary Baker Eddy, Sigmund Freud*, Frederick Ungar Publishing Company, New York 1962, p. 255.

including sexual taboos. As Michel Foucault pointed out, "the will to knowledge has not come to a halt in the face of a taboo that must not be lifted, but has persisted in constituting – despite many mistakes, of course – a science of sexuality" [3]. In the gradual transition from the *ars amandi* (the description of the ways of loving and the effects of love known in previous centuries) to the *scientia sexualis* (the analysis, classification, and regulation of sexual relationships) the focus shifts from the private to the public sphere. More precisely, to ensure the health and safety of the entire community, it becomes necessary to clearly demarcate the normal and the pathological, especially concerning sexual behaviours. Ultimately, as Georges Canguilhem emphasized, the "normal" itself began to be defined almost exclusively in relation to the "pathological"[4].

To establish certain boundaries between the normal and the abnormal in sexuality – explains medical historian Giuseppe Armocida – society has also turned to the doctrine of physicians. […] medicine did not decline the invitation, feeling itself capable, from the very beginning of the emergence of psychiatric doctrine, of studying and recognising certain conduct as pathological[5].

This has led to a sort of medicalisation of morality. Diederik Janssen summarises the phenomenon as follows: "Gradually, the idea of the sinner 'perverting' divine natural purpose by committing the sin gave way to a conception of the sinner 'suffering from a perversion' of the developing sex instinct, and indeed from 'specific perversions' rather than indiscriminate libertine frenzy"[6]. And so, if until the middle of the nineteenth century it was mainly the magistrates and theologians who dealt with perverts, now the doctor somewhat takes the place of the priest and the confessor, replacing virtues and sins with a supposedly scientific list of healthy and pathological behaviours[7]. The categories of "perversity" and "perversion"[8] become central.

[3] Michel Foucault, *The History of Sexuality I*, Pantheon Books, New York 1978, pp. 12-13.

[4] Georges Canguilhem, *Le normal et le pathologique*, Presses Universitaires de France, Paris 1966.

[5] Jutta M. Birkhoff, Giuseppe Armocida, Roberta Serra, *Perversioni, pervertimenti e perversità, ovvero parafilie*, "Rassegna italiana di criminologia", IX, 1, 2015, p. 41.

[6] Diederik F. Janssen, *From* Libidines nefandæ *to sexual perversions*, "History of Psychiatry", 31, 2020, p. 422.

[7] Lorenzo Benadusi, *Lecito e illecito. Nascita della sessuologia e invenzione delle perversioni nell'Italia tra Otto e Novecento*, "Zapruder. Rivista di storia della conflittualità sociale", 6, 2005, pp. 29-43, p. 36.

[8] As Gert Hekma explains, at the end of the nineteenth century "Most physicians still distinguished between biologically based 'perversions' and 'perversities' resulting from sexual exhaustion", Gert Hekma, *A history of sexology: social and historical aspects of sexuality*, in Jan Bremmer (ed.), *From Sappho to De Sade. Moments in the history of sexuality*, Routledge, London 1989, p. 180. In his *Psychopathia sexualis*, Krafft-Ebing had drawn a theoretical distinction between the notions of perversity and perversion. He explained that while the perverse individual, being inherently pathological, is not to be held responsible for his abnormality, the perverted individual, by deliberately choosing to pervert his impulses, is accountable for his abnormal behavior (Richard von Krafft-Ebing, *Psychopathia*

Following in the footsteps of pioneers such as Richard von Krafft-Ebing, Havelock Ellis, Auguste Forel, Ivan Bloch, Albert Möll, and Magnus Hirschfeld[9], between the end of the 19th century and the beginning of the 20th, Italian medicine also cautiously began to explain numerous sexual phenomena and certain anomalies[10], mirroring the approach of these innovators. An exceptional contribution was made by a young physician from Irpinia (southern Italy), Pasquale Penta, whom Paul Adolf Näcke, director of the Saxon Mental Hospital in Colditz, would describe as "a great scholar and promoter of sexology"[11].

"A disenchanted observer of human phenomena", Penta enjoyed considerable fame among his contemporaries, "putting himself forward in the Italian scientific community as one of the most prominent figures in the field [psychiatry and criminal anthropology], following the path recently laid out by Lombroso"[12]. Then, unjustly, he was almost completely forgotten[13]. Yet, it

Sexualis, traduzione italiana sulla 16ª e 17ª edizione tedesca completamente rielaborata dal Dott. Albert Moll con note di adeguamento al Diritto italiano a cura del Prof. Piero Giolla, Carlo Manfredi Editore, Milan 1966, p. 83). For further details on the distinction between perversity and perversion, see J.M. Birkhoff, G. Armocida, R. Serra, *Perversioni, pervertimenti e perversità*, cit.; Massimo Filippi, *L'invenzione della specie: sovvertire la norma, divenire mostri*, Ombre corte, Verona 2016; Matteo Loconsole, *Paolo Mantegazza. Alle origini dell'educazione sessuale*, Biblion edizioni, Milano 2021, p. 93.

[9] For an overview of the contributions of these authors to the emerging science of sexology, see, among many others, the volume by Vern L. Bullough, *Science in the Bedroom. A History of Sex Research*, Basic Books, New York 1994.

[10] Interesting studies on "sexual inversion" were conducted by Arrigo Tamassia (1849-1917); by Clodomiro Bonfigli (1838-1909), director of the Psychiatric Clinic of the University of Rome and of the Santa Maria della Pietà Asylum, who, within the context of criminal sexual behaviors, proposed the distinction between perversion (of a pathological nature) and perversity (an expression of vice and not of disease); by Silvio Venturi (1851-1900), director of the Girifalco Asylum, who believed that sexual disorders could be related to pathological processes and dwelt at length on what he called "sexual monstrosities", a term he used to indicate many of what we might now define as "paraphilias". On this subject, see J.M. Birkhoff, G. Armocida, R. Serra, *Perversioni, pervertimenti e perversità*, cit.

[11] Paul Näcke, *Penta als einer der besten Kenner und Förderer der Sexualwissenschaft*, "Zeitschrift für Sexualwissenschaft", 1, 1908, pp. 74-81, p. 74.

[12] Ilaria Gorini, Giuseppe Armocida, Jutta M. Birkhoff, *Pasquale Penta (1859-1904) un antropologo criminale non soltanto "lombrosiano"*, "Rassegna italiana di criminologia", XIV, 1, 2020, pp. 12-17, pp. 14-15.

[13] Among the few attempts to rescue Pasquale Penta from oblivion are the commendable efforts of Lucia Monacis (*Genio, follia e criminalità nella Belle Époque*, Pensa MultiMedia, Lecce 2009; *Genio, follia e criminalità nella Belle Époque. Pasquale Penta*, in Paolo Contini, Giovanni Pietro Lombardo, Maria Sinatra (a cura di), *Follia e imputabilità nelle perizie giudiziarie. Casi clinici e ricerche dall'Ottocento ad oggi*, Franco Angeli, Milan 2023, pp. 199-217); Chiara Beccalossi (*The Construction of Scientific Knowledge Regarding Female 'Sexual Inversion': Italian and British Sexology Compared, c. 1870-1920*, PhD Dissertation, Queen Mary University of London, London 2008; *Female Sexual Inversion. Same-Sex Desire in Italian and British Sexology, c.1870-1920*, Palgrave MacMillan, London 2012; also mentioned in *Arrigo Tamassia, l'inversione sessuale e la sessuologia italiana di fine Ottocento*, "Rivista Sperimentale di Freniatria. La rivista della salute mentale", CXXXVIII, 2, 2014,

was thanks to him that the "Archivio delle psicopatie sessuali" was launched in 1896. It was not only the first *European* Review of sexology[14], but also the first journal in the *world* to address "sexual deviance" [15].

The Review aimed to promote the scientific understanding of sexuality, especially its pathological forms, with particular attention to the practical applications that the studies and findings presented could have in the field of forensic medicine. Despite its exceptional nature and the more than satisfactory sales, the "Archivio" ceased publication after only one year of existence. No advance notice or explanation was given. The purpose of this article, therefore, is to trace the path that led Penta to establish the Review and to identify the possible reasons for the abrupt termination of his pioneering venture.

2. *From Verzeni's perversions to the "Archivio delle psicopatie sessuali"*

Penta took the first step towards the study of sexual psychopathy by analysing the case of Vincenzo Verzeni, the women strangler. This very young farmer from Bottanuco (near Bergamo), who was found guilty of the brutal murders of two women and the attempted murder of a third, was sentenced to life imprisonment with hard labour and, on 3 March 1874, transferred to the S. Stefano penal colony in the Gulf of Naples[16]. Cesare Lombroso, who had testified as an expert witness at Verzeni's trial, explained his criminal behaviour, at least in part, by a "kind of bloodthirsty fury that is associated with lechery"[17] and described him as "a savage with a lust for blood, a cannibal and therefore an atavistic criminal"[18]; a kind of a vampire[19] or violent savage;

pp. 27-41); Laura Schettini, who curated the entry "Pasquale Penta" in the *Dizionario Biografico degli italiani*, LXXXII, 2015; the articles by Marta Licata, Roberta Fusco, Silvia Iorio, Chiara Tesi, *Critical to the clinical value of anthropological anomalies of the skull in Forensic Psychiatry and Criminal Anthropology (from the lessons of Professor Pasquale Penta 1899-1900 academic year)*, "Medicina Historica", III, 1, 2019, pp. 10-15; and by I. Gorini, G. Armocida, J.M. Birkhoff, *Pasquale Penta*, cit.

14 L. Schettini, Entry "Pasquale Penta", cit.

15 Giovanni Dall'Orto, *Tutta un'altra storia. L'omosessualità dall'antichità al secondo dopoguerra*, Il Saggiatore, Milano 2015, p. 509.

16 *Traduzione di detenuti*, "La Provincia Gazzetta di Bergamo", III, 51, 3 March 1874, pp. unnum.

17 Cesare Lombroso, *Verzeni e Agnolotti studiati dal prof. Cesare Lombroso*, "Rivista di discipline carcerarie in relazione con l'antropologia, col diritto penale, con la statistica ecc.", 1873, III, 4-5, p. 201.

18 Renzo Villa, *Faits divers et crimines célèbres*, in Laura Bossi (sous la direction de), *Crime et folie*, Gallimard, Paris 2011, p. 113.

19 Nicole Rafter, Per Jørgen Ystehede, *Lombroso e la cultura di massa in Europa (1890-1930)*, in Silvano Montaldo, Paolo Tappero (a cura di), *Cesare Lombroso cento anni dopo*, UTET, Torino 2009, p. 189.

a degenerate with hereditary mental disorders[20] and even a necrophiliac[21]. Fourteen years later, it was Penta who studied Verzeni. Six years later, he published his reflections on the subject[22]. While openly embracing Lombrosian doctrines and adhering to his organic interpretation of disorders, Penta disagreed with certain of Lombroso's conclusions. According to Penta, who believed that every degeneration was an animal reversion, Verzeni was a degenerate[23] whose development was strongly influenced by both hereditary pathologies and the poor conditions of his psycho-physical environment[24]. The Bottanuco murders were "nothing more, nothing less than a bestial copulation[25], a case of reversion"[26]: the acts of a pervert who basically was no longer human[27].

[20] Patrizia Guarnieri, *Conflitti e convergenze tra psichiatria e legge (1876-1913)*, in Filippo Maria Ferro *et al.* (a cura di), *Passioni della mente e della storia: protagonisti, teorie e vicende della psichiatria italiana tra '800 e '900*, Vita & Pensiero, Milano 1989, p. 492.

[21] C. Lombroso, *Verzeni e Agnolotti*, cit., p. 204. For an in-depth analysis of the various Lombrosian interpretations of the Verzeni case, see Lorenzo Leporiere, *Anche il più piccolo particolare. Cesare Lombroso indaga sul caso Verzeni*, in Claudia Addabbo, Elena Canadelli, Luigi Ingaliso *et. al.* (a cura di), *Ad limina. Frontiere e contaminazioni transdisciplinari nella storia delle scienze*, Editrice Bibliografica, Milan 2023, pp. 248-257; Id., *Le confessioni di un vampiro. Cesare Lombroso al processo di Vincenzo Verzeni* in Paolo Contini, Giovanni Pietro Lombardo, Maria Sinatra (a cura di), *Follia e imputabilità nelle perizie giudiziarie. Casi clinici e ricerche dall'Ottocento ad oggi*, Franco Angeli, Milano 2023, pp. 120-144.

[22] Pasquale Penta, *I pervertimenti sessuali nell'uomo e Vincenzo Verzeni strangolatore di donne. Studio biologico*, Luigi Pierro Editore, Naples 1893. A much shorter version of this study had already been published in 1890: Id., *Vincenzo Verzeni e le parestesie sessuali*, "La Tribuna Giudiziaria", IV, 10, 25 March 1890, pp. 73-74. Penta would return to discussing Verzeni during the VIII session (held on 12 September 1891) of the Seventh Congress of the Società Freniatrica Italiana held in Milan, where he delivered a presentation titled *La genesi e il significato dei pervertimenti sessuali nell'uomo*, in *Atti del Settimo Congresso della Società Freniatrica Italiana Tenuto in Milano dal 9 al 12 Settembre 1891*, E. Rechiedei e C.i editori, Milano 1891, p. 120.

[23] P. Penta, *I pervertimenti sessuali*, cit. p. 123.

[24] *Ivi*, p. 148. Penta, much more than Lombroso, emphasises the importance of psycho-social factors in the Verzeni case. See C. Beccalossi, *Female Sexual Inversion*, cit. p. 151.

[25] As Luigi Roncoroni aptly summarises in his review of Penta's text for the Lombrosian "Archivio": "The main characteristics of these ferocious acts consisted of unconsciousness, to the point that he did not see, hear, or feel anything at that moment, he did not sense the danger; in the rudimentary nature of the sexual act as he would achieve erection without copulation, but merely by strangling the victim until suffocation occurred; and brutally, as in several instances, after suffocating the victim, he literally mutilated her in every way with a razor, extracting her organs, thrusting his hands inside, tearing off her limbs, sucking her blood, and biting her flesh". Luigi Roncoroni, *Pasquale Penta – I pervertimenti sessuali nell'uomo e Vincenzo Verzeni strangolatore di donne, Napoli, Pierro, 1892*, "Archivio di psichiatria, scienze penali ed antropologia criminale per servire allo studio dell'uomo delinquente" XIV, 3, 1893, pp. 309-310.

[26] P. Penta, *I pervertimenti sessuali*, cit., p. 93.

[27] Over time, Verzeni's "perversion" had taken on new meanings. Beccalossi summarises the issue as follows: "In prison, where sexual perversion was widespread, Verzeni had lost his sexual

The essay on Verzeni is of enormous interest for the purposes of this reconstruction as it represents the starting point for Penta's studies on sexual psychopathy[28]. That case, he states, "led me to delve into other sexual perversions"[29]. Indeed, the study of this case convinced him that the origin of almost all sexual perversions is more or less the same: they "are a manifestation of deviance which in turn is the effect of severe hereditary diseases, if not of difficult and bad environmental conditions"[30]. Drawing on Alfred Binet's theories on fetishism, Penta claims that the pleasure Verzeni took when strangling chickens as a child was closely related to that, he took as an adult in wrapping his hands around his victims' necks. On the basis of the analysis of the Bottanuco strangler, Penta concludes that perverts associate the achievement of pleasure with a certain image that was a source of erotic excitement in childhood. In perverts, sexual development is hindered by an erotic experience that occurred in early childhood. Sexual perversion is thus configured as a form of "rudimentary" and primitive love. A bestial love.

That same essay earns Penta considerable recognition in the scientific community. So much so that, a few years later, the small publishing house Fratelli Capaccini asked him – "already well-known in the field for his book *Pervertimenti sessuali*"[31] – to direct a journal entirely dedicated to the scientific study of sexual psychopathy: the "Archivio delle psicopatie sessuali". This journal is of fundamental importance as because it is the first of its kind. Magnus Hirschfeld's "Jahrbuch für sexuelle Zwischenstufen", referred to as the "direct precursor" of Penta's journal[32], would in fact be founded only three years later, in 1899[33]. As for the periodical "Der Eigene", established by Adolf Brand in 1896, it actually began as a political anarchist journal. It only began to address sexual and homosexual issues as of 1898–1899, focusing exclusively on these topics from 1899 onwards[34].

drive, but was known to other prisoners as a 'cinedo' [passive pederast]". C. Beccalossi, *Female Sexual Inversion*, cit., p. 151. Krafft-Ebing, who also dedicated some pages of his *Psychopathia Sexualis* to Verzeni's sadistic perversions, explicitly referred to Lombroso's work in describing his case.

28 P. Näcke, *Penta*, cit., p. 76.

29 P. Penta, *I pervertimenti sessuali*, cit., p. 153.

30 *Ibidem*.

31 *Programma*, in *Archivio delle psicopatie sessuali, rivista quindicinale di psicologia, psicopatologia umana e comparata di medicina legale e di psichiatria forense ad uso dei medici e dei giuristi, volume unico*, Fratelli Capaccini, Roma n.d. [1896], p. IV.

32 P. Näcke, *Penta*, cit., p. 76.

33 Kevin Dubout, *Durch Rezensionen zur Emanzipation? Die "Bibliographie der Homosexualität" (1900-1922) im Jahrbuch für sexuelle Zwischenstufen*, "LIBREAS. Library Ideas" 29, 2016, pp. 57-77; Bruno P.F. Wanrooij, *The History of Sexuality in Italy (1860-1945)*, in Perry Wilson (ed.), *Gender, Family and Sexuality: The Private Sphere in Italy, 1860-1945*, Palgrave Macmillan, Basingstoke and London 2004, pp. 173-191, p. 177; V.L. Bullough, *Science in the Bedroom*, cit., p. 67.

34 G. Dall'Orto, *Tutta un'altra storia*, cit., p. 476.

Penta's Review boasted a large number of contributors, including prominent figures in both medicine and law, such as Leonardo Bianchi, Penta's mentor; the physician, psychologist, and scholar of human sexuality Havelock Ellis; the German biologist, zoologist, and philosopher Ernst Haeckel; and the psychiatrist Paul Adolf Näcke, renowned for his studies on homosexuality and narcissism[35]. In 1896, Penta, who was 37 years old at the time, had not yet attained a prestigious academic position, but he managed to involve some of the most important scholars of "deviant" sexuality of the time in this unprecedented undertaking. His many contacts ensured the success of the project. These contacts were made in part through collaboration, that began in 1888, with the first Italian publication to promote the study of deviant sexuality, Lombroso's "Archivio di Psichiatria, Scienze Penali ed Antropologia"[36]; partly through participation in various congresses on psychiatry, medicine, and criminal anthropology[37]; and partly through direct and indirect links within the academic community. We agree with Beccalossi when claims that "Penta, despite his youth, was already a reputable member of the medical community that was gathering around the new discipline of criminal anthropology"[38]. The Capaccini brothers, editors of the new fortnightly review, have believed in the project from the outset, as they explain in the foreword to the review:

For some time now, the study of psychopathy and sexual feelings in general, has been rapidly developing both in Italy and abroad, gaining significant importance in Forensic Medicine, Psychiatry, Sociology, and Literature. A vicious prejudice, however, often prevents the publication and discussion of facts and observations that, if not concealed under the veil of excessive or misunderstood modesty, would greatly

[35] In addition to those mentioned, the Review's contributors include Dr. Andrea Cristiani from Naples; Augusto Di Luzenberger, a neuropathologist and lecturer in neuropathology in Naples; Dr. Alfredo D'Urso, also from Naples; Dr. Giulio Pelanda from Verona; the French journalist and essayist Marc-André Raffalovick (known for his studies on homosexuality); Prof. Giuseppe Ziino, lecturer in legal medicine in Messina, and many others.

[36] Since 1888, Penta had been collaborating and writing for the Lombrosian "Archivio". This collaboration continued even after the creation of his "Archivio delle psicopatie sessuali". Essays for the Lombrosian "Archivio" were also written by Andrea Cristiani and Giulio Pelanda. It is conceivable that their shared contributions to Lombroso's journal played a significant role in their decision to participate in Penta's 1896 endeavor.

[37] For instance, in 1891 Penta, Pelanda, and de Luzenberger participated in the Seventh Congress of the Società Freniatrica dedicated to this topic. See *Atti del Settimo Congresso della Società Freniatrica Italiana Tenuto in Milano dal 9 al 12 Settembre 1891*, E. Rechiedei e C.i editori, Milano 1891, pp. 4-5. The Eleventh Congresso Medico Internazionale, held in Rome in 1894, marked a very significant event. Many doctors attended, and Penta had the opportunity to meet, among others, Bianchi, Lombroso, D'Urso, as well as Paul Näcke and Havelock Ellis. See *Atti dell'XI Congresso medico internazionale, Roma, 29 March – 5 April 1894*, IV, Tipografia della Camera dei Deputati, Roma 1895.

[38] C. Beccalossi, *Female Sexual Inversion*, cit., p. 155.

enhance our knowledge, contributing to shed light on some still obscure phenomena in the psycho-physical life of humans and animals. Encouraged by many doctors, naturalists, lawyers, and judges, we have decided to publish a scientific journal – *Archivio delle psicopatie sessuali* – to collect everything that is being printed in our country and abroad on this important subject[39].

Indeed, the Review contained original articles, a column on clinical cases, and reviews of the most important publications (both Italian and foreign) on the subject[40]. In many cases, Penta himself authored both the scientific reviews and the original contributions, a third of which bore his signature. The journal was, therefore, almost entirely on his young, strong back; a back that would soon be stabbed.

3. *Chronicle of a Closure Foretold*

Leafing through the pages of Penta's Review, one comes across numerous "obscene" stories that risk promoting those very same human deviances under investigation[41]. Hence, the "vicious prejudice" that often prevents publications on these topics is lurking just around the corner. The editors, however, well-aware of possible attacks, emphasise that the purpose is strictly scientific. They explain that through the presentation of shocking cases, "Far [...] from us the dishonest aim of tickling certain human weaknesses"[42], the noble goal is to shed light on the darkest depths of human nature. Right from the very first pages, where they define the guidelines of the journal, their commitment is apparent:

> We will do our best to ensure that the publication is clear, elegant, and well-made; that the periodical is comprehensive and multi-faceted, written with seriousness and proper words, so that it does not feed morbid fantasies, that is, not tickle certain human weaknesses, but only serve the noblest purposes of science[43].

[39] Fratelli Capaccini, *Programma*, in *Archivio delle psicopatie sessuali*, cit., p. III.

[40] See, for example, Pasquale Penta, *Dei varii studi pubblicati sui pervertimenti sessuali dai primi sino ai più recenti dei giorni nostri*, in *Archivio delle psicopatie sessuali* [1896], pp. 8-14, 111-117. The third part of the contribution is missing because the Review ceased publication before it could be released.

[41] This accusation had already been made about ten years earlier by the scientific community itself, against Krafft-Ebing's *Psychopathia Sexualis*. Indeed, as soon as the book was published, it was criticised for justifying sexual deviance by recognising the right of perverts to exist. Moreover, it was even more seriously criticised for contributing, through the mere recounting of case studies, to the spread of sexual perversions among those who were not involved in the field yet had access to that work.

[42] *Programma*, in *Archivio delle psicopatie sessuali*, cit., p. IV.

[43] *Ivi*.

With these "scientific" reassurances, the "Archivio delle psicopatie" is thus launched. However, a few months later, following the release of the second issue in November 1896 – more precisely, the twenty-second issue – the publishing house ceases publication, unexpectedly. The question is: why? The reasons for such a drastic decision seem shrouded in mystery, and the answer is anything but simple. Clearly, it was not due to a lack of editorial success as the issues sold well[44]. Moreover, almost all the original contributions that appeared in the journal, along with other interesting essays on the same subjects, were republished in a series called the "Biblioteca dei pervertimenti sessuali"[45]. Furthermore, in this same period, the very important and well-known Bocca publishing also explored the theme of sexual perversions in its series called "Biblioteca antropologica-giuridica"[46]. This evidence demonstrates not only a significant interest in sexology within Italy but also the profitability of books on sexual perversions[47]. The cessation of the "Archivio delle psicopatie sessuali" did not occur due to a lack of interest from the medical community. What, then, were the underlying reasons? Let us attempt to analyze this question in detail.

During that year, there were already some warning signs. In the summer of 1896, the editors referred to "serious reasons, beyond our control" that delayed the publication of the new issue, despite "everything being ready and arranged as usual". Publication then resumed, but the sudden disappearance of almost all the advertisements indicated an evident disruption, likely causing significant economic repercussions for the publishers. Nevertheless, the journal continued to be printed up to Issue 22, dated November 15, 1896, though the Decem-

[44] The Capaccini themselves pointed out that the "Archivio delle psicopatie sessuali" was "highly sought after" in an additional page titled *Annesso all'Archivio delle psicopatie sessuali*, bearing the date 28 April 1897.

[45] The importance of this series also lies in having made the Italian translations of some important essays available. These include Richard von Krafft-Ebing, *Sadismo, masochismo e feticismo*, Capaccini, Roma 1896; Id., *Inversione sessuale nell'uomo e nella donna*, Capaccini, Roma 1897; A. Moll, *Uranismo e prostituzione mascolina nei tempi antichi e moderni, dal lato sociale e sessuale*, Capaccini, Roma 1897; Paul Moreau de Tours, *Le aberrazioni del senso genesiaco*, Capaccini, Roma 1897; Jean-Martin Charcot, *La fede che guarisce*, Capaccini, Roma 1897, and many others.

[46] See, among other studies, Mark André Raffalovich, *L'uranismo, inversione sessuale congenita: osservazioni e consigli*, Bocca, Torino1896; Albert von Schrenck-Notzing, *La terapia suggestiva delle psicopatie sessuali*, Bocca, Torino 1897; Alfredo Niceforo, *Il gergo nei normali, nei degenerati e nei criminali*, Bocca, Torino 1897; Richard von Krafft-Ebing, *Trattato di psicopatologia forense in rapporto alle disposizioni legislative vigenti in Austria, in Germania ed in Francia*, Bocca, Torino 1897; Annunziato La Cara, *La base organica dei pervertimenti sessuali e la loro profilassi sociale*, Bocca, Torino 1902; Auguste Forel, *La questione sessuale esposta alle persone colte*, Bocca, Torino 1907.

[47] Towards the end of the nineteenth century, the journal "L'anomalo", which often featured articles discussing sexual inversion and hermaphroditism, was also established. Obviously, the publications by the Capaccini brothers released in that the same period were much bolder and must have been considered even more "controversial". See L. Benadusi, *Lecito e illecito*, cit., p. 34.

ber issues were never published. Thus, the first scientific journal dedicated to sexual issues came to an unceremonious end. The journal fell silent, Penta fell silent, and the publishers fell silent. The collaboration between the Capaccini publishing house and Penta terminated. A few months later, in a supplementary loose sheet titled "Annesso all'Archivio delle psicopatie sessuali" dated April 28, 1897, the publishers addressed the readers of the "Archivio" to retain their interest and redirect their attention to a new journal (the "Rivista quindicinale di psicologia, psichiatria, neuropatologia" edited by Ezio Sciamanna and Giuseppe Sergi), which would commence publication in May and continue until 1899[48]. This journal was certainly less controversial than the one directed by Penta.

The abrupt discontinuation of the "Archivio delle psicopatie sessuali" appears to have stemmed from the fact that, as stated in the handwritten pages of the *Commemorazione dell'illustre concittadino, Professor Pasquale Penta*, the journal, in its brief existence, "caused much talk in the scientific community and [for this very reason] was suspended in 1897"[49]. As Bianchi noted, the material published in that journal "seemed indecent to some"[50], and Gorini remarked that it attracted "criticism from moralists"[51].

Bruno Wanrooij is even more explicit, stating that Penta was "accused of immorality for his studies on sexuality"[52]. It is likely that some protested against the journal, prompting the Capaccini brothers to cease its publication by the end of that same year, despite its editorial success[53]. This likely created tensions with Penta. In a 1903 review, Penta expressed hope that Hirschfeld's journal would achieve greater success than his own "Archivio," stating that he had attempted to "overcome the prejudices and false modesty of society" with his journal, but that "due to the fault of the publisher, the journal was closed down"[54]. His words encapsulate the dual reasons for this abrupt cessation: the

[48] See the supplement *Annesso all'Archivio delle psicopatie sessuali* bearing the date 28 April 1897.

[49] *Commemorazione dell'illustre concittadino, Professor Pasquale Penta, morto in Napoli il 29 decorso Novembre*, Dal registro dei processi verbali delle delibere Consigliari in Fontanarosa, manoscritto unnum. In reality, as we have seen, the Review ceased publication as early as November 1896.

[50] Leonardo Bianchi, *Prefazione* in Pasquale Penta, *La simulazione della pazzia*, Perrella, Naples 1905 (3rd edition), pp. unnum.

[51] I. Gorini, G. Armocida, J.M. Birkhoff, *Pasquale Penta*, cit., pp. 14-15.

[52] Bruno P.F. Wanrooij, *Storia del pudore. La questione sessuale in Italia 1860-1940*, Marsilio Editori, Venezia 1990, pp. 40-41.

[53] Alessandro Merci explicitly states that those were the years when the studies by the founder of the "Archivio delle psicopatie sessuali" "were at the centre of fierce controversies". The same was the case for Paolo Mantegazza's studies on erotic physiology and a considerable body of literature regarded as overly licentious. Alessandro Merci, *Alla ricerca dell'inverecondia: una polemica letteraria intorno all'Intermezzo di rime dannunziano*, "Griseldaonline", 13, 2013, pp. 1-23.

[54] Pasquale Penta, (review) *"Jahrbuch für sexuelle Zwischenstufen mit besenderer Berucksochtigung der Homosexualität" 1899*, "Rivista mensile di psichiatria forense, antropologia criminale e scienze affini", 2, 1903, p. 524.

excessive prudery of Italian society and the role of the Capaccini brothers, who perhaps lacked the fortitude to withstand it, given their small publishing house. This, however, remains a hypothetical reconstruction yet to be proven (or disproven). Nonetheless, Näcke, a collaborator of the journal, seems to confirm this: "Whether his journal did not find the right support among his compatriots, or mainly because of inconveniences with the publisher, the fact remains that Penta's journal was unfortunately discontinued after only one year"[55].

In any case, far from being discouraged by the failure of his first publication, in 1898, Penta would establish a new journal, the "Rivista mensile di psichiatria forense, antropologia criminale e scienze affini", which would provide a broader framework for his studies on sexuality and reach a larger number of readers[56]. Leaving behind the Capaccini brothers, the new publishing house became the Cavalier A. Tocco, based in Naples. The new Review showcased the best works on forensic psychopathy, focusing particularly on crime in Southern Italy. It had three guiding principles: the social and legal examination of the "natural history" of criminals and the mentally ill; emphasis on methods from natural sciences applied to sociological and legal studies; and the analysis of sex-related pathologies and crimes. As can easily be guessed, the latter aspect represented a continuation of the objective of the previous Review: it challenged the still prevailing excessive *pruderie*, but since the investigation of sexual psychopathy was just one theme among others, it would ultimately cause much less clamour and discontent. Penta's interest in sexuality extended beyond his publications. In his university lectures, he devoted special attention to this topic. He also explored Freudian theories of sexuality[57], contributing to their dissemination[58] at a time when, in Italy, they were still unknown and wich, a few years later, would be looked at with suspicion, if not outright hostility, largely due to Freud's emphasis on sexuality[59].

[55] P. Näcke, *Penta*, cit., p. 78.

[56] *Ibidem.* Penta published the "Rivista mensile di psichiatria forense" until his death in 1904. Some evidently confused the two journals and wrote that the "Archivio delle psicopatie sessuali" "appeared for eight years from 1896 to 1904", see Erwin J. Haeberle, *Sexology: From Italy to Europe and the World*, in Chiara Simonelli, Filippo Petruccelli, Veronica Vizzari (a cura di), *Sessualità e terzo millennio, studi e ricerche in sessuologia clinica*, I, Franco Angeli, Milano 1997, p. 20.

[57] References to Freud and his theory of the influence of sexual functions on certain neuroses can already be found in Pasquale Penta, *Influenza degli organi e delle funzioni sessuali sul modo di agire del sistema nervoso* (General Review), in *Archivio delle psicopatie sessuali*, cit., pp. 246-258, pp. 253-254. Later, in his essay *In tema di pervertimenti sessuali* (which appeared in the "Rivista mensile di psichiatria forense, antropologia criminale e scienze affini", 3-4, pp. 69-95), he would openly adhere to Freud's "psychiatric" views on homosexuality, seen as a variation of sexuality developed over time.

[58] Penta believed that Freud's theories on sexuality were not very original per se. Quite the contrary. However, he did acknowledge that the centrality Freud attributed to sexuality (for explaining neuroses and, more generally, accounting for various aspects of human life) was the theories' real strength.

[59] See Enrico Morselli, *La psicoanalisi. Studi e appunti critici*, 2 voll., Bocca, Milano 1912. More

4. *Conclusion*

While the 19th century exhibited a profound trust in scientific knowledge, the pervasive moralism of the era compelled scientists interested in exploring a field as indecent yet as compelling as sexuality to proceed with caution and sensitivity[60]. A declared scientific intent was often insufficient; some works on sexuality were accused of immorality, and even of being pornographic, designed solely to provoke public opinion[61]. Thomas Laqueur coined the term "medical pornography"[62] to describe this literary genre, explaining: "By pornography, I mean not only those dangerous books – the books to be read with one hand, in Rousseau's famous phrase – whose explicit purpose was to spark sexual fantasy and sustain masturbation, but a considerable swath of modern imaginative fiction"[63]. This included medical texts that, while analyzing various aspects of sexuality, recounted its most emblematic stories. Those who attempted to address the subject felt compelled to defend themselves against (or preempt) potential accusations by emphasizing that "the morality that wants to hide and punish what it cannot hide should be replaced with one that observes, meditates, studies, and heals"[64].

Moreover, if the scientific debate on sexuality in general raised numerous questions, the discourse on deviance and perversion provoked even more. In this context, the challenge was not only to overcome certain prejudices related to sexuality but also to determine whether it was appropriate to discuss perversion outside the exclusive realm of specialists. The aim was to warn people against the dangers and prevent the risks of sexual aberrations. Essentially, the question was whether the general public should remain uninformed about the depths of the human psyche, which should therefore be the sole concern of specialists, or whether they should be educated to recognize and avoid such dangers. However, opinions on this matter were far from unanimous. This extreme caution often resulted in the use of metaphors, synonyms, or Latin terms, particularly when the articles had a more popularizing

generally, to understand the reception the Freudian thought was given in Italy, we recommend the now classic book by Michel David, *La psicoanalisi nella cultura italiana*, Boringhieri, Torino 1966. It is noteworthy, however, that in the 642 pages of the text, Michel David never once mentions Penta.

60 L. Benadusi, *Lecito e illecito*, cit., pp. 29-30.

61 Paolo Mantegazza's volume, *Gli amori degli uomini*, had also been described as "an obscene book to make a lot of money". Paolo Mantegazza, *Prefazione all'undecima edizione* (1892) in *Gli amori degli uomini. Saggio di una etnologia dell'amore*, I, Paolo Mantegazza Editore, Milano 1892, p. IX.

62 For example, Thomas W. Laqueur, *Solitary Sex. A Cultural History of Masturbation*, Zone Books, New York 2003, pp. 15, 85, 173.

63 *Ivi*, p. 334.

64 Vito Massarotti, *Nel regno di Ulrichs. Appunti e considerazioni sull'omosessualità maschile*, Bernardo Lux editore, Roma 1913, pp. VI-VII.

intent. Yet, these literary devices, or rather precautions, were not limited to popular works. It was not uncommon to encounter such measures even in works intended for a specialist audience. In the preface to the first edition (1886) of his *Psychopathia Sexualis*, Krafft-Ebing explained:

> The following pages are addressed to those who have devoted themselves to rigorous studies in natural science and jurisprudence. To prevent the non-specialist from reading this work, the Author was forced to choose a title intelligible only to the scholar and to use technical terms whenever possible. Furthermore, he considered it convenient to quote some particularly indecent expressions in Latin instead of German[65].

Freud himself, in his letters to Wilhelm Fliess, used Latin to describe certain sexual acts[66]. Penta adopted a similar approach when illustrating the incompleteness of Verzeni's crimes, describing them in terms of "lack of *immissio penis in vaginam*"[67]. In Italy, many other authors who wrote essays and articles on similar subjects took similar precautions. Given these premises, one might argue that despite Italy's puritanical culture in the late 19th century, there were many readers interested in these topics. However, as emphasized by Patrizia Moro[68], the number of (non-pornographic) books discussing sexuality during those years was very modest[69]. Anthony Giddens also points out that: "Medical journals and other semi-official publications were accessible only to very few; and until the latter part of the nineteenth century, most of the population was not even literate [...] this literature was not available to the majority, even of the educated population"[70]. In the first

[65] Richard von Krafft-Ebing, *Le psicopatie sessuali. Con speciale considerazione alla inversione sessuale. Studio clinico-legale*, Bocca, Torino 1889, p. IX. Similar measures had already been taken in the past. The Swiss physician Samuel-Auguste Tissot, for example, whose writings had repeatedly been accused of "promoting vice by describing its dangers", had originally published his medical treatise on the alleged negative effects of masturbation (*L'Onanisme. Dissertation sur les maladies produites par la masturbation*) in Latin to counter such accusations. On this subject, see T.W. Laqueur, *Solitary Sex*, cit., p. 337.

[66] See Peter Gay, *The Bourgeois Experience. From Victoria to Freud*, I, *Education of the Senses*, Oxford University Press, New York, Toronto, London 1984, pp. 10-11; Norman O. Brown, *Life against Death. The Psychoanalytical Meaning of History*, Sphere Book, London 1970, pp. 69-73; Michel Onfray, *Crepuscolo di un idolo. Smantellare le favole freudiane*, Ponte alle Grazie, Milano 2011, p. 107.

[67] P. Penta, *I pervertimenti sessuali*, cit., p. 131.

[68] Patrizia Moro, *1870-1920: La letteratura scientifica e divulgativa* in Giorgio Rifelli, Corrado Ziglio (a cura di), *Per una storia dell'educazione sessuale*, La Nuova Italia, Scandicci 1991, pp. 205-217.

[69] While the so-considered more "established" and, therefore, "safe" books were republished multiple times by various publishers within the span of a few years, many others, despite being essential, remained untranslated, unpublished, or unavailable in Italy for a long time. These include some fundamental works by Bloch, Ellis, and Moll, as well as those by Freud, which began to be published in Italy only many years later. See M. David, *La psicoanalisi nella cultura italiana*, cit.

[70] Anthony Giddens, *The Transformation of Intimacy. Sexuality, Love and Eroticism in Modern Societies*, Stanford University Press, Stanford 1992, p. 24.

forty years after the Unification of Italy, literacy in the peninsula was very limited: in 1861, 74.7% of the population was illiterate; in 1871, 68.8%; and still in 1901, one out of every two citizens could neither read nor write[71]. This means that such texts dedicated to the "scientific" aspects of sex, whether intended for general circulation or not, could be read by a very small number of Italians: a few educated, middle and upper-middle-class adults, and almost exclusively males. Although fewer in number than one might expect, some series extensively covering topics related to sexuality began to emerge. This was the case with certain manuals published by Hoepli and the "Biblioteca di Scienze Moderne" by the Bocca brothers. Despite the dominant bourgeois morality being unreceptive to new studies on sexual behavior, books dedicated to these topics still enjoyed considerable success[72]. So much so that some publishing houses, such as that of the Capaccini brothers, invested in the "sexual question" and, more specifically, in the "question of sexual psychopathy." However, despite the success of the "Archivio delle psicopatie sessuali", the Review ceased publication just after a few months. This paper attempts to shed light on the possible reasons for the sudden and unexpected change of direction by the Capaccini brothers. It has been suggested that the reasons lie in the rumors that arose from that publication, likely originating within the medical community to which the journal was predominantly addressed, although it was certainly also read by curious non-experts.

Aside from the unfortunate conclusion of this venture and the reasons underlying it, what deserves our attention is the modernity of Pasquale Penta's intuition. It is disconcerting how easily both his role as a physician and an academic, as well as his contribution to the recognition of sexuality as a science, have been forgotten. His death at the age of only 45 may have contributed to this; it is reasonable to assume that had he not died so prematurely, he would have made other significant contributions to the field of sexology. Paul Näcke is convinced that if Penta had lived longer and had known the works on sexology written after his death, especially those of Hirschfeld, he would have certainly changed some of his views. This is because Penta never jumped to hasty conclusions nor stubbornly clung to his positions, but always paid tribute to progress[73].

He had challenged the *pruderie* and sexual morality of certain doctors and numerous intellectuals, and, although he seemed at least partly defeated, with the creation of his "Rivista mensile di psichiatria forense", subsequent publications, and his stimulating lectures, he had risen again and achieved a

[71] The data are reported in P. Moro, *1870-1920: La letteratura scientifica e divulgativa*, cit., p. 209.

[72] Margherita Pelaja, Lucetta Scaraffia, *Due in una carne, Chiesa e sessualità nella storia*, GLF Editori Laterza, Roma-Bari 2014, p. 241.

[73] P. Näcke, *Penta*, cit., p. 80.

significant victory over the bigoted Italian society of those years. Of course, as revolutionary as he was at the time, many of his contributions appear outdated today. Since Penta, sexology has evolved considerably, becoming an independent field separate from psychiatry or criminal anthropology. As Vern L. Bullough wrote, "Research continues today on a variety of topics, from sexually transmitted diseases to gender dysphoria, although much of the cutting-edge material is in journals, the quality of which has risen considerably in the past decade"[74]. However, it is undeniable that without pioneers like Pasquale Penta, research in this field today would still be mired in old stereotypes and likely less free from moral conditioning, and therefore less scientific and rigorous.

[74] Vern L. Bullough, Entry "Sexuality" in Arne Hessenbruch (ed.), *Reader's Guide to the History of Science*, Fitzroy Dearborn Publishers, London-Chicago 2000, p. 686.

Focus

Advances in developmental psychology: theoretical and empirical perspectives

Edited by Edoardo Vaccargiu, Emiliano Loria

Introduction

Edoardo Vaccargiu[*], Emiliano Loria[**]

This thematic focus comprises five invited contributions from developmental psychologists, philosophers, and cognitive scientists whose research centers on the communicative and social dimensions of children's early cognitive development. It provides a rich and updated overview of the main advances in developmental psychology from different theoretical and empirical perspectives. The selection of the contributions has been guided by the intent to offer the reader a wide range of alternative views on children's early cognitive abilities, thereby giving representativeness to different theoretical approaches and providing a comprehensive picture of the main debates and research directions in the field.

We are convinced that child development research is facing a challenging and complex task that can no longer be postponed, given the numerous, and high-quality studies on infants' cognitive abilities on the one hand, and the increasing empirical evidence on very young infant's ability to read the context and to be receptive to emotional reactions to stimuli. There has been a tendency, so far, to separate cognitive development from the self-regulatory development of emotions in early childhood. We believe that this separation in developmental psychology and cognitive science needs to be overcome; in this regard, the Focus we proudly present in this issue of "Mefisto" has the humble intention of beginning to intertwine these fields of investigation.

Among all the sophisticated cognitive and affective capacities, we believe that infant communication can offer fertile ground for such a meeting. If we accept the assumption that human emotional experience – throughout the individual life span – is inseparable from the relationships and social contexts in which it arises, we can identify the parameters that define the social context and how the latter change throughout development[1]. The following essays offer insightful suggestions along these lines.

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[1] See in this regard Lavinia Barone, *Le emozioni nello sviluppo. Percorsi tipici e atipici*, Carocci, Roma 2021, in particolare le pp. 26-27.

The opening essay has been entrusted to Edoardo Vaccargiu; in *Pragmatics and modularity: A developmental perspective*, Vaccargiu focuses on the prelinguistic phases of infants' communicative development and discusses the empirical plausibility of Dan Sperber and Deirdre Wilson's Pragmatics Module Hypothesis[2] in light of existing data from developmental pragmatics. Building upon the tenets of the post-Gricean view of communication and drawing from different conceptions of post-Fodorean modularity in evolutionary cognitive science, Vaccargiu spells out the predictions of the modular view of pragmatic comprehension from a developmental perspective and discusses the extent to which these are validated by developmental studies on infants' interpretation of ostensive communication. According to Vaccargiu, key findings from infant pragmatics are best explained by positing a domain-specific "pragmatics module" that infers the meaning of ostensive-communicative stimuli based on contextually modulated relevance expectations. Once we frame this proprietary mechanism from the proposed "algorithmic modularity view", he argues, the different expectations elicited by ostensive communication in infancy can be accounted for as resulting from the functioning of a unitary cognitive module tailored for pragmatic comprehension. Overall, this contribution highlights the significance of developmental research for unraveling open foundational questions in cognitive pragmatics.

The Gricean framework, though, is not the only game in town. In *La comunicazione prelinguistica: Impegni e intenzioni*, Antonio Scarafone takes issue with the dominant Gricean view centered on the notion of communicative intention and outlines an alternative picture of prelinguistic communication based on the notion of shared commitment, recently pioneered by Bart Geurts[3] in theoretical and evolutionary pragmatics. By critically discussing key experiments on infants' production and comprehension of pointing gestures typically framed along a Gricean perspective, Scarafone compares the Gricean interpretation with a commitment-based analysis of the empirical results. Specifically, Scarafone contends that the notion of communicative intention falls short of capturing the complexity of early communication and is potentially misleading in accounting for the obtained results. A commitment-based perspective, he argues, is better positioned for explaining the experimental data and can pave the way for a broader "neo-Vygotskyan" conception of children's communicative and cognitive development as resulting from the internalization of early dialogic interactions. Altogether, Vaccargiu and Scarafone's articles provide two alternative lenses to look at children's

[2] Dan Sperber, Deirdre Wilson, *Pragmatics, Modularity and Mind-reading*, "Mind & Language", 17, 2002 pp. 3-23.

[3] Bart Geurts, *Communication as commitment sharing: Speech acts, implicatures, common ground*, "Theoretical Linguistics", 45, 1-2, 2019, pp. 1-30.

prelinguistic communication and give the reader a glimpse of an open debate in developmental psychology that still engages many scholars in the field.

In *Labelling and categorization: Evidence from experimental studies on infants*, Mara Floris focuses on two key experimental studies investigating how linguistic labels influence categorization processes in infancy and critically discusses different explanations of the main effects observed on empirical grounds against the backdrop of the contemporary debate about the influence of language on perception and thought. The role of labels in young children's categorization, Floris argues, can be coherently explained by Gary Lupyan's[4] Language Feedback Hypothesis (LFH), according to which labels selectively enhance the perceptual features of the labeled category, thereby outlining a radical view that blurs the distinction between perception and cognition and advocates the multimodality of language activated representations. LFH challenges the traditional model of conceptual representations, which distinguishes between semantic and visual representations, and advocates a view in which language-activated representations are multimodal. Floris emphasizes that according to LFH's approach, concepts are not represented by a single modality, but by the activation of all relevant modalities; for example, the visual components of concepts can be represented by some of the same neural mechanisms that process their visual perception. Therefore, the efficiency of conceptual activation by language suggests that conceptual representations are more easily activated by linguistic cues.

In *Extending cognitive development into the body and the environment*, Christian Kliesch makes a brief introduction to the most promising phenomenological perspectives referring to infant development, focusing on Gibson's *Ecological Perception* and Varela, Thompson and Rosch's *Enactivism*, as well as Clark's *Predictive Coding* framework. Despite their differences, according to Kliesch all these approaches "share a focus on explaining cognition beyond the limits of the brain". Studying cognition as part of a general system that includes the body and the environment could have significant implications for the explanations generated by developmental psychology. In particular, Kliesch delves into infants' sophisticated learning strategies, emphasizing the phenomenological aspects related to intersubjective and environmental elements. While learning mainly involves past experiences, it is also enhanced by the changing environments that accompany the specific developmental trajectory. In this context, Linda B. Smith and colleagues have coined the term "curriculum for statistical learning" [5]. Such a curriculum is shaped by

[4] Gary Lupyan, *Linguistically modulated perception and cognition: The label-feedback hypothesis*, "Frontiers in psychology", 3, 54, 2012, A54.

[5] Linda B. Smith, Swapnaa Jayaraman, Elizabeth Clerkin, and Chen Yu, *The Developing Infant Creates a Curriculum for Statistical Learning*, "Trends in Cognitive Sciences", 1767, 22, 2018, p. 4.

the environment and the changes brought about by infants' emerging motor skills, which affect opportunities for action and interaction. Surprisingly, recent studies suggest that this developmental process might begin before birth. While more systematic studies are needed to understand the contribution of the fetal environment to the emergence of later cognitive abilities, this new "enactivist" perspective fosters rethinking how certain concepts and abilities (e.g., self-awareness) can emerge from the child's interaction with the environment and the opportunities it provides. Throughout his article, Kliesch provides a number of intriguing suggestions for further systematic research into how body and environment shape cognition during development.

The last contribution spotlights a research field recently revived in the study of the human mind and behavior, that of emotions and affective phenomena[6], focusing in particular on the complex interplay between emotion and cognition in cultural learning throughout development. In *Emotional displays as windows on the cultural world: Open directions for developmental research*, Ganzetti, Hominis, and Clément provide a comprehensive and updated review of studies investigating the role of emotional displays in children's social learning processes. Building on the Affective Social Learning framework by Fabrice Clément and Daniel Dukes[7], the authors argue that young children, as "attentive explorers", can use adults' emotional displays to gather social values and information worth being learned. The idea that novel, naive members of a social group, use others' emotional expressions to assimilate unfamiliar content indicates that humans, from a very early developmental stage, are able to actively seek and selectively filter information to understand their environments. In these terms, the Authors explain the fundamental notion of "selective trust", and the related, crucial role of early affective components in the infant's environmental exploration. Under this perspective, Ganzetti, Homins and Clément highlight the need "to investigate how the observation of emotional displays contributes to the acquisition of culturally relevant knowledge".

Without further ado, we leave the readers to dive into this interesting collection of articles and enjoy their journey through child development research.

6 Daniel Dukes *et al.*, *The Rise of Affectivism*, Nature Human Behaviour 5, 2021, pp. 816-820.

7 Fabrice Clément, Daniel Dukes, A*ffective Social Learning: A Lens for Developing a Fuller Picture of Socialization Processes*, in The Oxford Handbook of Emotional Development, ed. Daniel Dukes, Andrea C. Samson, and Eric A. Walle, Oxford University Press, 2022.

Pragmatics and modularity: a developmental perspective

Edoardo Vaccargiu*

Abstract: Cognitive research on pragmatics relies on the idea that pragmatic comprehension is a matter of inferring speaker intentions. Sperber and Wilson elaborate on this idea from a modular perspective by positing the existence of a mental module dedicated to pragmatic comprehension. The purported modularity of pragmatics is debated in the contemporary landscape, but little effort has been dedicated so far to exploring the possible developmental implications of this modular view. This paper aims to fill this gap by reconciling extant findings from developmental psychology with the hypothesis of a pragmatics module for interpreting overt communicative behaviors.

Keywords: Developmental pragmatics, modularity, infancy, ostensive communication.

1. *Introduction*

In the late twentieth century, language and cognition research has been marked by two influential trends: a modular view of the mind, and an intentional-inferential view of communication. According to the modular view systematized by Fodor[1], the mind is a cluster of sub-systems, or "modules", that perform specific cognitive functions with relative independence from each other. According to the intentional-inferential view, pioneered by Grice[2] and developed in cognitive psychology by Sperber and Wilson[3], human communication relies on the inferential attribution of speakers' communicative intentions. The modular view, initially applied to describe peripheral and "encapsulated" cognition was unsuitable to account for global

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1 Jerry A. Fodor, *The Modularity of Mind*, Cambridge, MIT Press, 1983.

2 Paul H. Grice, *Meaning*, "The Philosophical Review", 66(3), 377, 1957, pp. 377-388.

3 Dan Sperber, Deirdre Wilson, *Relevance: Communication and Cognition*, Blackwell, Oxford 1986/1995.

and context-sensitive communicative inferences; over time, reformulations of the modular view led it to converge with the intentional-inferential view. This convergence is realized in Sperber and Wilson's[4] "Pragmatics Module Hypothesis" (henceforth, 'PMH', or 'the Hypothesis').

The Hypothesis states that pragmatic comprehension is carried out by a dedicated cognitive system closely related to the mind-reading system underlying the interpretation of others' behavior in terms of attributed mental states. Building on Grice's[5] intuition that understanding meaningful utterances requires reading the speaker's intentions, Sperber and Wilson[6] argue that communicative intentions are inferred through an inferential heuristic (i.e., the pragmatics module) which is triggered by ostensive communicative stimuli and is guided by expectations of relevance. Ostensive stimuli, though, are both verbal and non-verbal: linguistic utterances, pointing gestures, showing gestures, or nodding by catching the addressee's attention, *inter alia*, can all be ostensive behaviors. In principle, this broadens the scope of PMH to include the prelinguistic stages of children's pragmatic development, characterized by the comprehension of pointing gestures and overtly intentional demonstrations. This opens a meaningful testing ground for assessing the empirical plausibility of the Hypothesis: Can early pragmatics be explained along a modular view? How can the Hypothesis be articulated from a developmental perspective?

Early involvement in ostensive communication is nowadays supported by a wealth of data from developmental psychology. Still, this body of research is mostly considered in relation to the Natural Pedagogy mechanism adapted for social learning[7], and less with respect to the hypothesis of an early interpretative heuristic for communicative behaviors. Although developmental research has early been pointed out as a promising testing ground for PMH[8], little theoretical effort has been dedicated so far to exploring its developmental side. This paper aims to fill this research gap by providing a cognitive account for articulating the Pragmatics Module Hypothesis from a developmental perspective, thus assessing its empirical significance in light of available data from infant pragmatics.

The paper is structured as follows. In section 2, I provide a concise overview of the concept of modularity after Fodor[9], and I illustrate three main conceptions of

[4] D. Sperber, D. Wilson, *Pragmatics, Modularity and Mind-reading*, "Mind & Language", 17, 2002 pp. 3-23.

[5] P.H. Grice, *Meaning*, cit.

[6] D. Sperber, D. Wilson, *Pragmatics, Modularity and Mind-reading*, cit.

[7] Gergely Csibra, György Gergely, *Natural Pedagogy*, "Trends in Cognitive Sciences", 13, 4, 2009, pp. 148-153.

[8] Deirdre Wilson, *New directions for research on pragmatics and modularity*, "Lingua", 115, 8, 2005, pp. 1129-1146.

[9] J.A. Fodor, *The Modularity of Mind*, cit.

modularity that will help to navigate different facets of PMH. In section 3, I spell out PMH by discussing its theoretical foundations in Relevance Theory and its relationship with the three conceptions previously outlined. Throughout section 4, I focus on the centerpiece of PMH, and I articulate it from a developmental perspective by discussing its consistency with key empirical findings from infant pragmatics. Finally (section 5), I argue that these findings are best explained by positing a unique cognitive mechanism for pragmatic comprehension.

2. *Kinds of modularity*

Fodor's[10] modularity hypothesis is based on the distinction between two types of cognitive systems: input modular systems, which pertain to peripheral cognition and support basic cognitive processes (e.g., vision and syntactic parsing), and central non-modular systems, which integrate information from different sources and support high-level cognitive processes (e.g., belief fixation and decision-making). Fodor's modules are domain-specific, automatic, fast, hardwired, functionally dissociable, innately specified, and "informationally encapsulated", in the sense that they draw from a limited proprietary database without being influenced by contextual factors, expectations, or beliefs. Among these properties, encapsulation is the heart of Fodorean modularity[11], and serves as an architectural constraint that marks the distinction between peripheral and central cognition: insofar as informational integration and globality of processing are negatively correlated with encapsulation (hence, modularity), central cognition, which requires both, cannot be modular.

Along the intentional-inferential view, pragmatic inference is conceived as a context-dependent process of fixing a belief about the speaker's intended meaning and is thus a bad candidate for Fodorean modularity: "[s]ince there is no principled restriction on the type or source of contextual information used in constructing hypotheses about the speaker's meaning, the process would be global in Fodor's sense"[12]. Overall, there was no room for convergence between the modular and the intentional-inferential views within Fodor's modular mind[13].

[10] *Ivi*.

[11] J.A. Fodor, *The Mind Doesn't Work That Way*, MIT Press, Cambridge 2000, p. 63.

[12] D. Wilson, *New directions for research on pragmatics and modularity*, cit., pp. 1140-1141. For an insightful discussion about encapsulation, cognitive impenetrability, and pragmatic inference, see Nicholas E. Allott, *Encapsulation, inference and utterance interpretation*, "Inquiry", 2023, pp. 1-35.

[13] Cfr. D. Wilson, D. Sperber, *Pragmatics and Modularity*, in S. Davis (ed.), *Pragmatics: A Reader*, Oxford University Press, 1991, pp. 583-595. But see also Asa Kasher, *On the pragmatic modules: A lecture*, "Journal of Pragmatics", 16, 5, 1991, pp. 381-397, for a seminal account of linguistic pragmatics from a modular perspective.

Later conceptualizations of the modularity hypothesis overcome the sharp distinction between peripheral and central cognition, thus paving the way for investigating high-order cognitive processes from a modular perspective. Evolutionary psychologists proposed a 'massively modular' picture of the mind as composed of a network of specialized modules that evolved under selective pressure. Just as each blade of the Swiss knife is suitable to perform a specific function, each module of the mind was shaped by natural selection to deal with specific adaptive problems[14]. The evolutionary perspective substantially departs from Fodor's view. Mental modules are defined "by the specific operations they perform on the information they receive, rather than by a list of necessary and sufficient features"[15], and are largely conceived as *evolved adaptations*, namely, domain-specific computational mechanisms tailored to solve adaptive problems across human evolution. This consistently loosened Fodor's constraints on the notion of "mental module", thus marking the shift from an architectural to a *functional* conception of modularity. Domain-specificity (i.e., the property of being specialized to process specific classes of inputs) is entailed by the functionalist approach and is the only necessary property of modules in the massively modular mind, though other Fodorean properties are variably (and often inconsistently) invoked by massive modularity theorists[16].

The evolutionary-functionalist approach strongly influenced early developmental research on mind-reading[17], and the shift to the modular view of pragmatics in Relevance Theory went along with Sperber's[18] involvement in the massive modularity debate. However, the fact that the notion of modularity lacks univocal treatment within the functionalist approach, makes it difficult to pin down a specific framework against which to evaluate PMH[19]. If pragmatics is not a Fodorean module, which kind of module would it be?

[14] Leda Cosmides, John Tooby, *Beyond intuition and instinct blindness: Toward an evolutionary rigorous cognitive scienc*e, "Cognition", 59, 1994, pp. 41-77.

[15] H. Clark Barrett, Robert Kurzban, *Modularity in cognition: Framing the debate*, "Psychological Review", 113, 3, 2006, p. 629.

[16] For a discussion, see Giordana Grossi, *A module is a module is a module: Evolution of modularity in Evolutionary Psychology*, "Dialectical Anthropology", 38, 3, 2014, pp. 333-351. For an overview of the main commonalities between different massive modularity accounts, see H.C. Barrett, R. Kurzban, cit.

[17] Simon Baron-Cohen, *Mindblindness*, Cambridge, MIT Press, 1995; Philip Gerrans, *The theory of mind module in evolutionary psychology*, "Biology & Philosophy", 17, 3, 2002, pp. 305-321.

[18] D. Sperber, *Modularity and Relevance: How Can a Massively Modular Mind Be Flexible and Context-Sensitive?*, in P. Carruthers, S. Laurence, S. Stich (Eds.), *The Innate Mind*, Oxford University Press, 2005 (pp. 53-68).

[19] For a discussion see Marco Mazzone, *Pragmatica e Modularismo*, in F. Domaneschi, V. Bambini (a cura di), *Pragmatica Sperimentale*, Bologna, Il Mulino, 2022, pp. 247-258.

Drawing on Samuels[20] and Gerrans[21], I propose to disentangle three distinct but related conceptions of modularity that are often intertwined in evolutionary psychology. These conceptions articulate the notion of functional specialization at the basis of the massive modularity approach along three explanatory directions:

- *Epistemic conception*: modules are domain-specific bodies of knowledge. They are functionally specialized to the extent that they evolved to solve ancestral adaptive problems.
- *Algorithmic conception*: modules employ domain-specific algorithms. They are functionally specialized to the extent that they exploit specific procedures tailored to the regularities of their input domain.
- *Hardware conception*: modules are neurocognitive mechanisms with distinct neural realizations. Their algorithmic-functional specialization is implemented at the neural level.

The thread linking the three conceptions is the notion of domain specificity: it is part and parcel of the Epistemic and Algorithmic conception, and it is presupposed by the Hardware conception. Still, the three conceptions undertake different explanatory and theoretical commitments. The Epistemic conception aims at providing plausible evolutionary hypotheses about the adaptive challenges that bore on the selection of a modular adaptation throughout phylogeny; however, it is noncommittal to the architectural features of modules. By contrast, the Hardware conception entails that modules are localizable in the brain and functionally dissociable. The Algorithmic conception focuses on the analysis of the algorithmic procedures, or processing mechanisms, that are exploited by a posited module to process inputs from its proprietary domain. In this case, too, none of Fodor's features but domain specificity is necessarily required by algorithmic modules, but whether a given module has any of these features is an open empirical question[22]. Keeping in mind this threefold distinction between modularity conceptions will be useful for properly understanding the Hypothesis.

[20] Richard Samuels, *Evolutionary Psychology and the Massive Modularity Hypothesis*, "The British Journal for the Philosophy of Science", 49, 4, 1998, pp. 575-602.

[21] P. Gerrans, *The theory of mind module in evolutionary psychology*, cit.

[22] For an analogous conception of modularity based on the necessity of domain-specificity at the expense of other properties (included encapsulation), see Max Coltheart, *Modularity and Cognition*, "Trends in Cognitive Sciences", 3, 3, 1999, pp. 115-120.

3. *The Pragmatics Module Hypothesis*

The foundations of the Hypothesis rely upon Sperber and Wilson's theory of ostensive communication, according to which communicators provide evidence of their intended meanings by way of ostensive stimuli, and addressees work these meanings out through mentalistic inferences[23]. Ostensive stimuli express a communicative intention (that is, a second-order informative intention), and the addressee's inferential interpretation of an ostensive stimulus leads to the attribution of a communicative intention to the communicator; crucially, this mentalistic attribution underlies the interpretation of any kind of attended ostensive stimulus, being it linguistic or not. Relevance Theory considers intention attribution as part and parcel of the pragmatic interpretation of utterances, in particular, and of ostensive stimuli, in general, and the mentalistic character of pragmatic inferences grounds Sperber and Wilson's[24] proposal that pragmatic comprehension involves a sub-module of mind-reading.

A methodological assumption behind PMH is that mind-reading is underpinned by "a set of special-purpose mechanisms or sub-modules attuned to regularities in narrower domains"[25], rather than by a monolithic capacity. Baron-Cohen[26] put forth this assumption with a modular account of mind-reading which distinguishes multiple cognitive mechanisms subserving the computation of different kinds of mental states, such as the 'Intentionality Detector' and the 'Theory-of-Mind Mechanism', respectively tailored to the attribution of volitional and epistemic states. Broadly speaking, Sperber and Wilson's[27] proposal aimed at fitting the pragmatics module within a multi-component 'Mindreading System' akin to Baron-Cohen's, i.e., a cognitive mechanism specifically tailored to the attribution of communicative intentions[28].

How should we conceive the relationship between Relevance Theory and the three conceptions of modularity previously outlined? Let us move by dismissing the Hardware conception, for which modules are localizable in the brain. Relevance Theory is primarily concerned with providing a cognitive psychological account of the information-processing mechanisms underlying pragmatic comprehension at the sub-personal *behavioral* level of analysis, while not specifying any implementational account of the neurocognitive

[23] D. Sperber, D. Wilson, *Relevance*, cit.

[24] D. Sperber, D. Wilson, *Pragmatics, Modularity and Mind-reading*, cit.

[25] D. Wilson, *New directions for research on pragmatics and modularity*, cit., p. 1138.

[26] S. Baron-Cohen, *Mindblindness*, cit.

[27] D. Sperber, D. Wilson, *Pragmatics, Modularity and Mind-reading*, cit.

[28] This raises the (still open) question about the relationship between the purported pragmatics module and the other mind-reading mechanisms. For a take on this point in light of data from clinical pragmatics, see Diana Mazzarella, Ira Noveck, *Pragmatics and mind reading: The puzzle of autism*, "Language", 97(3), 2021, e198-e210.

mechanisms that realize pragmatic processes in the brain[29]. In this sense, relevance theorists are not necessarily committed to the Hardware conception.

A pragmatics module along the Epistemic conception was initially advanced by Sperber[30] as the corollary of an argument for language evolution from non-linguistic forms of ostensive communication, which, in turn, emerged as an exaptation from advanced metapsychology. According to a recent version of this view[31], ostensive communication evolved in a partner-choice social ecology where cooperative means for manipulating others' mental states and complementary inferential skills of social vigilance gained adaptive value, and it was made possible by the sophisticated capacity for "recursive mind-reading"[32] that is needed to attribute full-blown communicative intentions (that are, second-order intentions)[33]. Prolonged recursive mind-reading favored the emergence of a dedicated cognitive mechanism that made ostensive communication operate more efficiently. Without delving into the details of this account, it is worth noticing for our discussion that relevance theorists often describe the pragmatics module as an evolved adaptation that facilitated the recursive mentalistic processes required for fully participating in ostensive communication,

[29] Robyn Carston, *Thoughts and Utterances: The pragmatics of explicit communication*, Oxford, Blackwell, 2002, pp. 1-12. Specifically, Carston draws upon Dennett's distinction between personal and sub-personal levels of analysis, the former explaining human action according to a wide pattern of rational activity, the latter focusing on the level of the underlying psychological mechanisms (Daniel Dennett, *Content and Consciousness*, Routledge, London 1969). At the sub-personal level, she further distinguishes between behavioral analyses in terms of information-processing mechanisms, and implementational analyses in terms of underlying neural activity.

[30] D. Sperber, *Metarepresentations in an Evolutionary Perspective*, in D. Sperber (ed.), *Metarepresentations: A Multidisciplinary Perspective*, Oxford University Press, 2000; Gloria Origgi, D. Sperber, *Evolution, communication and the proper function of language*, in P. Carruthers, A. Chamberlain (Eds.), *Evolution and the Human Mind*, Cambridge University Press, 2000, pp. 140-169.

[31] Christophe Heintz, Thom Scott-Phillips, *Expression Unleashed: The evolutionary and cognitive foundations of human communication*, "Behavioral and Brain Sciences", 46, e1, 2023.

[32] T. Scott-Phillips, *Speaking our Minds*, Basingstoke, Palgrave Macmillan, 2015.

[33] According to D. Sperber, *Metarepresentations in an Evolutionary Perspective*, cit., pp. 117–138, the attribution of full-blown communicative intentions requires entertaining a fourth-order metarepresentation, whose analytical complexity is appealed to as an argument supporting the existence of a pragmatics module that computes high-order metarepresentations in communication. This account has important limitations on developmental grounds, and the lack of evidence on children's advanced metarepresentational abilities precludes the possibility of reconciling empirical data with (Epistemic) PMH. Minimalist alternatives about the mentalistic burden of early ostensive communication have been provided (e.g., Richard Moore, *Gricean Communication and Cognitive Development*, "The Philosophical Quarterly", 67(267), 2017 pp. 303–326; Nima Mussavifard, *Metarepresenting in Communication*, "Synthese", 202(168), 2023). The Algorithmic modularity view defended in this paper can be further articulated along with a minimalist analysis of communicative intentions (much in line with Juan Carlos Gómez, *Mutual awareness in primate communication: A Gricean approach*, in S. T. Parker, R. W. Mitchell, M.L. Boccia (Eds.), *Self-Awareness in Animals and Humans*, Cambridge University Press, 1994, pp. 61-80). Due to space constraints, I postpone the discussion of this issue to a later occasion.

thereby fulfilling the explanatory requirement of the Epistemic conception of modularity. Evolutionary arguments about adaptive problems, though, are difficult to extend on developmental grounds straightforwardly and therefore beyond this paper's purposes.

The centerpiece of Sperber and Wilson's proposal is best captured by the Algorithmic conception of the pragmatics module[34], and it is based on the claim that pragmatic inference is underpinned by a domain-specific algorithmic procedure for processing ostensive stimuli, also called "relevance-guided comprehension procedure":

a. Follow a path of least effort in computing cognitive effects by testing interpretative hypotheses in order of accessibility;
b. Stop when your expectations of optimal relevance are satisfied[35].

The application of this comprehension procedure is justified by the fact that ostensive stimuli exhibit a specific regularity, namely, they communicate a "presumption of optimal relevance" (i.e., the Communicative Principle of Relevance[36]), in the sense that they are assumed to be (1) sufficiently relevant to be worth the addressee's attention, and (2) the most relevant ones compatible with the communicator's abilities and preferences[37]. In other terms, by producing an ostensive stimulus that attracts the addressee's attention, the communicator invites the addressee to presume that the stimulus will satisfy the addressee's expectation of relevance; accordingly, the addressee accesses possible interpretations of the stimulus by following the least effort path and retains the interpretation that satisfies her occasion-specific expectations of relevance[38]. Crucially, the relevance-guided comprehension procedure works as a 'fast and frugal heuristic'[39], namely, a non-demonstrative inferential process that automatically accomplishes a certain task in an efficient

[34] See also R. Carston, *Relevance-theoretic pragmatics and modularity*, "UCL Working Papers in Linguistics", 9, 27., 1997; D. Mazzarella, *Pragmatics, Modularity and Epistemic Vigilance*, "Argumenta", 1, 2, 2016, pp. 181–193; D. Mazzarella, I. Noveck, *Pragmatics and mind reading*, cit.; D. Wilson, *New directions for research on pragmatics and modularity*, cit.; D. Wilson, D. Sperber, *Relevance Theory*, in L.R. Horn, G. Ward (eds.), *The Handbook of Pragmatics*, Blackwell, 2004, pp. 607-632.

[35] D. Sperber, D. Wilson, *Pragmatics, Modularity and Mind-reading*, cit., p. 18.

[36] D. Wilson, D. Sperber, *Relevance Theory*, cit., p. 612.

[37] D. Sperber, D. Wilson, *Relevance*, cit., pp. 266-278.

[38] "Relevance" is technically understood as a property of inputs to cognitive processes, and it is defined as a cost-benefit notion: the greater the cognitive benefits gainable from processing an input, the greater its relevance; the lesser the processing effort needed to gain these benefits, the greater the relevance. For a detailed analysis, see D. Wilson, D. Sperber, *Relevance Theory*, cit.

[39] Gerd Gigerenzer, Peter M. Todd, the ABC Research Group, *Simple Heuristics that Make us Smart*, Oxford University Press, 1999.

(though error-prone) way, while granting economy of processing effort[40]. The relevance-guided heuristic spells out the domain-specific algorithm that is automatically applied to process ostensive stimuli, and it is tailored to the regularity of this specific input domain, thereby fulfilling the explanatory requirement of the Algorithmic conception of modularity.

To summarize, the pragmatics module takes as input an ostensive stimulus, delivers as output an interpretative hypothesis about the communicator's intended meaning, and is underpinned by an inferential heuristic guided by expectations of optimal relevance. Evolutionary considerations about the adaptive value of a dedicated mechanism for pragmatic comprehension (i.e., Epistemic modularity) frequently go along with PMH, but the centerpiece of Sperber and Wilson's proposal relies on the automatic application of the relevance-guided heuristic to ostensive stimuli, which articulates PMH from an Algorithmic modularity perspective. How can this algorithmic view be fruitfully extended on developmental grounds?

4. *An early developing pragmatics module*

To spell out the conceptual and empirical implications of PMH on developmental grounds some preliminary remarks are needed. First, the relevance-guided heuristic is generally discussed in Relevance Theory in relation to utterance interpretation, but it is assumed to be recruited, with some caveats, for the processing of any attended ostensive stimulus. As for linguistic utterances, the "testing of interpretative hypotheses" in clause (a) (cf. sect. 3) refers to the reconstruction of the explicit and implicit meanings by way of disambiguation, pragmatic enrichment, and implicature derivation, *inter alia.* Pre- and proto-linguistic children lack the lexical knowledge to fully draw on these linguistic pragmatic processes. However, data from infant pragmatics, as will be shown, can be brought to bear on the hypothesis that non-linguistic ostensive behaviors are spontaneously processed through inferential heuristics guided by context-specific relevance expectations – that is, the core tenet of Relevance Theory. This body of data will thus be the focus of our investigation throughout the next sections.

Second, against the backdrop of the Algorithmic conception, the pragmatics module is *domain-specific* to ostensive stimuli, i.e., it is specialized to process *only* stimuli belonging to this input domain. Since the class of ostensive stimuli is quite heterogeneous (cf. sect. 1), we must preliminarily constrain it by specifying some criteria for characterizing a given stimulus as

[40] D. Sperber, D. Wilson, *Pragmatics, Modularity and Mind-reading*, cit.

ostensive or not. Drawing on Sperber and Wilson[41], we can technically define ostensive stimuli as behaviors designed and intentionally performed by the communicator to (i) attract the audience's attention, and (ii) prompt the audience's inference towards the conveyed informative content. Furthermore, ostensive behaviors regularly (iii) convey a presumption of optimal relevance, as entailed by the Communicative Principle of Relevance (cf. sect. 3). Thus, we will take (i), (ii), and (iii) as defining criteria for a given behavior to belong or not to the class of ostensive stimuli.

Now, arguing for a domain-specific algorithmic module for ostensive behaviors amounts to claiming that a specific processing mechanism is recruited to selectively respond to behaviors that jointly fulfill (i), (ii), and (iii). This entails, by Hypothesis, that the pragmatics module would 'recognize' ostensive behaviors as such, and its underlying functioning would be evidenced by spontaneous behavioral responses that somehow reflect this recognition. Specifically, the operations of the pragmatics module would be evidenced by spontaneous behavioral responses showing that ostensive behaviors

(a) attract the recipient's attention;
(b) prompt the recipient's inference toward the conveyed content;
(c) elicit the recipient's expectations of relevance;

whereas analogous responses would not be jointly elicited by non-ostensive behaviors[42]. In sum, empirical data showing the behavioral responses (a), (b), and (c) in the presence of ostensive behaviors, and concurrent lack of such responses to non-ostensive behaviors, would evidence the underlying functioning of a cognitive mechanism *specialized* for processing ostensive stimuli, thus vindicating PMH on empirical grounds. Accordingly, my survey of the data from infant pragmatics will be directed at presenting empirical studies showing that ostensive behaviors (a) attract infants' attention, and (b) prompt infants' inferences toward the conveyed content by (c) eliciting expectations of relevance. While discussing these findings, I will spell out a threefold graded distinction between relevance expectations that guide infants' communicative understanding, thus highlighting the nature and the scope of early pragmatic inferences. Then, I will argue that, from an Algorithmic modularity perspective, such data are best explained by positing a pragmatics module specialized for ostensive stimuli.

41 D. Sperber, D. Wilson, *Relevance*, cit., pp. 151-155.

42 More specifically, (a), (b), and (c) are likely realized by two kinds of spontaneous behavioral responses: the first bringing about the receiver to preferentially attend to the ostensive stimulus over competing ones, the second prompting the receiver to infer the content conveyed on the basis of the context-specific expectations of relevance raised by the stimulus. Thanks to an anonymous reviewer for prompting me to clarify this point.

4.1. *Preferential attention toward ostension*

A compelling hypothesis on the role of ostension in infancy comes from Csibra[43], who argues that young infants are endowed with a hardwired "ostension detector" rendering them strongly responsive to *ostensive signals* such as eye contact, infant-directed speech (or 'motherese'), and contingent responsivity. Ostensive signals have the function of marking an action as communicative[44], and directly specify their target as the addressee of the communicative act.

Infants' attentional responsiveness to ostensive signals is nowadays corroborated by a wealth of empirical studies[45]. Preference for eye contact over averted gaze is found in newborns[46], and it goes along with active enjoyment in maintaining it and discontent with breaking it[47]. Preference for motherese over adult-directed speech is already present at birth[48], it is corroborated by multi-lab studies[49], and it is cross-culturally complemented by caregivers' tendency to shift to motherese whenever they address infants[50]. Contingent responsivity and alternated response patterns emerge precociously in mother-infant interactions[51], and several studies show that infants prefer and try to prolong contingent interactions[52]. Altogether, these findings show that young infants preferentially attend to the source of an ostensive signal, thus providing empirical evidence that ostensive stimuli (a) attract infants' attention. In other

[43] G. Csibra, *Recognizing Communicative Intentions in Infancy*, "Mind & Language", 25, 2, 2010, pp. 141-168.

[44] See N. Mussavifard, *Metarepresenting in Communication*, cit.

[45] For a systematic review, see G. Csibra, *Recognizing Communicative Intentions in Infancy*, cit.

[46] Teresa Farroni, G. Csibra, F. Simion, M. H. Johnson, *Eye contact detection in humans from birth*, "Proceedings of the National Academy of Sciences", 99, 14, 2002, pp. 9602-9605.

[47] Sylvia M.J. Hains, Darwin. W. Muir, *Infant Sensitivity to Adult Eye Direction*, "Child Development", 67, 5, 1996, pp. 1940-1951.

[48] Robin P. Cooper, Richard N. Aslin, *Preference for Infant-Directed Speech in the First Month after Birth*, "Child Development", 61, 5, 1990, pp. 1584-1595.

[49] The ManyBabies Consortium, *Quantifying Sources of Variability in Infancy Research Using the Infant-Directed-Speech Preference*, "Advances in Methods and Practices in Psychological Science", 3, 1, 2020, pp. 24-52.

[50] Elise A. Piazza, Marius C. Iordan, Casey Lew-Williams, *Mothers Consistently Alter Their Unique Vocal Fingerprints When Communicating with Infants*, "Current Biology", 27(20), 2017, pp. 3162-3167.

[51] S. Dominguez, E. Devouche, G. Apter, M. Gratier, *The Roots of Turn-Taking in the Neonatal Period*, "Infant and Child Development", 25, 3, 2016, pp. 240-255.

[52] Lynne Murray, Colwyn Trevarthen, *Emotional regulation of interactions between two-month-olds and their mothers*, in T. Field, N. A. Fox (eds.), *Social perception in infants*, Ablex, Norwood 1985, pp. 177-197; A. Henning, T. Striano, *Infant and Maternal Sensitivity to Interpersonal Timing*, "Child Development", 82, 3, 2011, pp. 916-931.

words, ostensive signals effectively function as *acts of address*[53] for prelinguistic infants, who recognize being the intended targets of communication and readily direct their attention toward communicators[54].

Ostensive communication seems already at work in early infancy, but data on infants' attention biases towards ostension are yet undetermined to support PMH. In addition, we need evidence that ostensive behaviors (b) prompt infants' inferences toward the content by (c) eliciting their expectations of relevance. Csibra's account of the cognitive mechanisms underlying the processing of ostensive behaviors provides a fruitful framework to navigate extant data from infant pragmatic research.

4.2. *Early relevance expectations*

According to Csibra, ostensive signals "create a shortcut for triggering inferential processes that would interpret accompanying actions of the same source"[55]. Being addressed by an ostensive signal would thus set out favorable conditions for gathering evidence to infer the content of the informative intention. From the perspective of the underlying cognitive mechanisms, detecting ostension and inferring the content can be temporally and procedurally separated, but they are *bound* together: ostension triggers interpretative inferences constrained by specific pragmatic expectations that are selectively elicited when infants are addressed ostensively. By reviewing some empirical studies on infants' interpretation of ostensive-referential behaviors, I suggest that these early pragmatic expectations can be understood as different declinations of more general expectations of relevance about the content communicated.

First, ostensive stimuli trigger expectations of *local* relevance in young infants[56], namely, expectations that the target referent of an ostensive-deictic act is worth the addressee's attention[57]. Several studies show that when a po-

[53] R. Moore, *Gricean Communication and Cognitive Development*, cit.

[54] It is widely debated in the literature whether early responsiveness to ostensive signals reveals infants' capacity to recognize full-blown "communicative intentions" (i.e., second-order informative intentions; see G. Csibra, *Recognizing Communicative Intentions in Infancy*, cit.; J.C. Gómez, *Mutual awareness in primate communication: A Gricean approach*, cit.; R. Moore, *Gricean Communication and Cognitive Development*, cit.; Antonio Scarafone, *What would it be like for prelinguistic communication to be Gricean?*, "Language & Communication", 90, 2023, pp. 82-94). The modular view put forth in this paper shares the concerns of more deflationary positions on the issue which consider available developmental data undetermined for demonstrating a full grasp of communicative intentions (cfr. footnote 33).

[55] G. Csibra, *Recognizing Communicative Intentions in Infancy*, cit., p. 144.

[56] György Gergely, Pierre Jacob, *Reasoning about Instrumental and Communicative Agency in Human Infancy*, "Advances in Child Development and Behavior", 43, 2012, pp. 59-94.

[57] These are also called "referential expectations" in the literature (G. Csibra, cit.). The proposed rephrasing in terms of relevance expectations is motivated by the fact that ostensive-deictic acts

tential deictic behavior (e.g., gaze-shifting) is preceded by ostensive signals, infants expect to find something at the location where the source's gaze is directed, as manifested by gaze-following responses. For instance, in Senju and Csibra's eye-tracking study[58], 6-month-old infants were presented with video stimuli starting with an adult looking down at a table, followed by an attention-getting phase, and ending with the adult's gaze shifting toward one of two toys placed on either side. The experimental manipulation occurred in the attention-getting phase: in the ostensive condition, the adult looks into the camera and raises her eyebrows before looking at one of the objects. In the non-ostensive condition, the infant's attention is caught by a moving cartoon appearing on the adult's head, before she turns toward the toy. Results show that infants are significantly more likely to follow the adult's gaze shift and to look at the target toy in the ostensive condition, as compared to the non-ostensive one. In a second experiment, the attention-getting event occurs simultaneously with a vocal greeting, either in motherese (ostensive) or in adult-directed speech (non-ostensive). Again, infants follow the adult's gaze in the ostensive condition and not in the non-ostensive one, thus showing that both visual and auditory ostensive signals strongly affect infants' tendency to follow referential gaze-shifting. These results have been corroborated by larger-sample multi-lab studies[59], and replicated with young infants from non-Western populations less prone to face-to-face interactions with babies[60]. In sum, expectations of *local* relevance assist the grasping of the communicator's referential intention to direct the addressee's attention toward a target object, thereby bringing infants to attentively focus on it. Enhanced gaze-following in ostensive conditions with young infants provides evidence for the precocious manifestation of this kind of expectation.

Second, ostensive-referential communication triggers expectations of *episodic* optimal relevance, that is, expectations that ostensive stimuli convey relevant and useful information in the episodic context of cooperative joint activities[61]. Studies on infants' interpretation of informative pointing provide

pre-empt the audience's attention to preferentially focus on a target object, thus functioning as cues for presumed relevance.

58 Atsushi Senju, G. Csibra, *Gaze Following in Human Infants Depends on Communicative Signals*, "Current Biology", 18, 9, 2008, pp. 668-671.

59 Krista Byers-Heinlein *et al.*, *The development of gaze following in monolingual and bilingual infants: A multi-laboratory study*, "Infancy", 26(1), 2021, pp. 4-38.

60 Mikolaj Hernik, Tanya Broesch, *Infant gaze following depends on communicative signals: An eye-tracking study of 5- to 7-month-olds in Vanuatu*, "Developmental Science", *22*, 4, 2019, pp. 1-8.

61 The notion of *episodic* optimal relevance extends Gergely and Jacob's (cit., p. 75) notion of *local* relevance, which "enables [*infants*] to determine the intended referent of the communicator's deictic referential act required for fulfilling the shared episodic goal". The two notions slightly diverge in scope. Determining the referent of the communicator's deictic act may not be enough to understand the episodic information conveyed through it (see T. Behne *et al.*, cit., p. 498). For this

evidence for the emergence of this expectation during the second year of life. Behne, Carpenter, and Tomasello engaged 14- and 18-month-olds in a cooperative hide-and-search game where they had to find a toy in one of two buckets[62]. In the familiarization trials, the experimenter visibly places the toy in one of the buckets and encourages the child to search for it. In the experimental trials, the experimenter conceals the hiding process to the child and points toward the toy's location in different ways depending on the condition. In the ostensive condition, the pointing gesture is accompanied by eye contact, raised eyebrows, and alternated gaze between the child and the bucket. In the non-ostensive condition, the experimenter extends her index finger toward the target bucket absentmindedly by pretending to examine her wrist. Despite the gesture's surface structure being similar across conditions, children search randomly in the non-ostensive one, while in the ostensive condition, they interpret the pointing as indicating the toy's hiding place and approach the correct bucket above chance levels[63]. This result shows that young children interpret similar deictic gestures differently depending on whether these are performed ostensively or not[64]. Overall, these studies suggest that, shortly after the first birthday[65], infants infer the content of the informative intention expressed through ostensive-referential gestures by selecting a relevant interpretation (i.e., "the toy is there") in the shared episodic context. This interpretation is "optimally relevant" because it warrants worthwhile improvements (i.e., "cognitive benefits"[66]) to infants' representation of the hide-and-search scenario for low cognitive effort, and it is presumably the most easily accessible in the cooperative context established by the experimenter during the familiarization phase. Crucially, the

reason, I distinguish "local relevance" expectations needed for identifying the intended referent (i.e., grasping the referential intention), and "episodic relevance" expectations that guide the inference to the intended content (i.e., understanding the informative intention). The proposed reading extends the notion of *local* relevance even to contexts not involving shared goals (cf. footnote 70) and allows accounting for partial (i.e., merely referential) understanding of pointing gestures.

62 Tanya Behne, Malinda Carpenter, Michael Tomasello, *One-year-olds comprehend the communicative intentions behind gestures in a hiding game*, "Developmental Science", 8, 6, 2005, pp. 492-499.

63 Similar results are observed in a second experiment which measures infants' reactions to the experimenter's gaze shifts toward the target bucket in ostensive *versus* non-ostensive conditions.

64 For analogous results, see Tiziana Aureli, Paola Perucchini, Maria Genco, *Children's understanding of communicative intentions in the middle of the second year of life*, "Cognitive Development", 24, 1, 2009, pp. 1-12; Olivier Mascaro, Ágnes M. Kovács, *The origins of trust: Humans' reliance on communicative cues supersedes firsthand experience during the second year of life*, "Developmental Science", 25, 4, 2022, e13223.

65 See T. Behne, Ulf Liszkowski, M. Carpenter, M. Tomasello, *Twelve-month-olds' comprehension and production of pointing*, "British Journal of Developmental Psychology", 30, 3, 2012, pp. 359-375, for a similar task adapted for 12-month-olds.

66 D. Wilson, D. Sperber, *Relevance Theory*, cit.

episodic relevance expectations that guide this pragmatic inference must be concurrently assisted by *local* relevance expectations which help to anchor referentially the conveyed content. Behne and colleagues' study shows that these relevance expectations are selectively prompted by ostensive-referential behaviors, while not being jointly elicited when deictic behaviors are deprived of their ostensive character.

Third, infant-directed ostensive communication elicits expectations of *enduring* relevance[67], namely, expectations that ostensive stimuli provide new and socially relevant (non-episodic) information for them to acquire, and that, as a result, can be shared by other individuals outside the preceding communicative interaction. Enduring relevance expectations are the basis of the Natural Pedagogy mechanism for social learning through ostensive communication (cf. sect. 5) and seem more prominently triggered in communicative contexts that do not involve shared episodic goals between the adult and the infant. Egyed, Király and Gergely's study with 18-month-olds provides compelling evidence for this kind of expectation[68]. In the familiarization phase, one experimenter (the demonstrator) shows two novel objects to the infant, and expresses positive emotions (e.g., joy/interest) when looking at one, and negative emotions (e.g., dislike/disgust) when looking at the other. This phase varies across two conditions. In the ostensive condition, the demonstrator addresses the infant with eye contact and name-calling in motherese before displaying the object-directed emotion. In the non-ostensive condition, the demonstrator acts as being alone without addressing the infant before or after the emotion display. In the test phase, a second experimenter (the requester) enters the scene without looking at the objects and asks the infant to give her one of the two. Results show that infants are more likely to give the requester the object toward which the demonstrator emoted positively in the ostensive condition, while they are at chance in the non-ostensive condition. Infants seem to assume that the ostensively displayed preference can be generalized to the requester, while this assumption is not licensed in the absence of ostension[69]. This study suggests that infants interpret ostensive emotional demonstrations toward a novel object as displaying an enduring pleasant/unpleasant property of the object-kind, rather than expressing the idiosyncratic preference of the demonstrator, and the presence/absence of

[67] G. Gergely, P. Jacob, *Reasoning about Instrumental and Communicative Agency in Human Infancy*, cit., pp. 74-80.

[68] Katalin Egyed, Ildikó Király, G. Gergely, *Communicating Shared Knowledge in Infancy*, "Psychological Science", 24(7), 2013, pp. 1348-1353.

[69] For similar results, see G. Gergely, K. Egyed, I. Király, *On Pedagogy*, "Developmental Science", 10(1), 2007, pp. 139-146; Christopher Vredenburgh, Tamar Kushnir, Marianella Casasola, *Pedagogical cues encourage toddlers' transmission of recently demonstrated functions to unfamiliar adults*, "Developmental Science", 18(4), 2015, pp. 645-654.

ostension appears to be crucial for disambiguating between these two interpretations. The generalization of the ostensively expressed preference to the requester shows that, in this context, emotional displays are likely interpreted as transmitting novel and worthwhile (i.e., relevant) information that helps young children navigate the social world. In sum, *enduring* relevance expectations can assist young children's interpretation of ostensive actions as vehicles of non-episodic information about socially relevant preferences that are generalizable across individuals and worth learning[70].

Another meaningful study on the effect of relevance expectations in infancy is the one by Marno and Csibra with 18-month-olds[71]. In the demonstration phase, children are introduced to a wooden device with a heart-shaped lamp in the middle and two buttons (one blue, the other red) on the two sides of the device, and they see two different experimenters (E1 and E2) who, in turns, enter the room and press three times either the red button (e.g., E1) or the blue one (e.g., E2). During E1's turn, the device emitted lights and sounds twice out of three attempts with the red button, while the blue button pressed by E2 triggered the beeping event only once. In the crucial experimental condition, E1 acts on the device without looking at or communicating with the child, whereas E2 greets the infant before pressing the button and displays excitement in an ostensive way after the only successful attempt with the blue button[72]; then, in the testing phase infants are allowed to act on the device themselves. Results show that most of them pressed the ostensively demonstrated blue button although it was less effective than the red button during the demonstration phase[73]. That is, first-hand evidence about the efficiency of two alternative methods as a function of their probability of producing an effect from the device can be overridden by ostensive emotional demonstrations, thus causing infants to opt for the less effective one. Presumably, young children interpreted the ostensive demonstration as showing the relevance of the demonstrated information and indicating which button should be pressed at the expense of consideration of efficiency. Interestingly, while the cost of choosing any of the two buttons is equal, the benefits of opting for the most effective one (quantifiable as a function of effects' probability) are higher; however, the ostensive demonstration biases children

[70] When the ostensive demonstration is directed to a target, as in Egyed and colleagues' study, *enduring* relevance expectations must be assisted by concurrent *local* relevant expectations about the intended referent to which kind-relevant information is presumed to apply.

[71] Hanna Marno, G. Csibra, *Toddlers favor communicatively presented information over statistical reliability in learning about artifacts*, "PLoS One", 10, 3, 2015, e0122129.

[72] Importantly, the order of communicative *versus* non-communicative demonstrations was counterbalanced across participants.

[73] By contrast, the proportion of children pressing the most effective red button is reversed in a baseline experiment with a different group of participants whereby both E1 and E2 act non-ostensively.

to assume they could likely gain more benefits from the least effective choice, thus providing evidence for stronger expectations of relevance prompted by ostensive communicative actions. It is unclear whether the expectations elicited in this study relate to cases of episodic or enduring relevance; most likely, they lie somewhere between expecting to get more excitement in the 'here and now' and gaining pedagogical instructions about the right way to act on novel artifacts.

Infants' interpretation of ostensive behaviors is assisted by early pragmatic expectations. According to the analysis just proposed, these can be viewed as graded declinations of general relevance expectations: local relevance expectations that bias infants' attentional focus toward target objects or situations, episodic relevance expectations about useful information in cooperative joint activities, and enduring relevance expectations about generalizable knowledge and behaviors to be learned and possibly reproduced, although the distinction between them is not cut and dried. While local relevance is evidenced in 6-month-olds' gaze-following, episodic and enduring relevance expectations are increasingly manifested during the second year of age, when children become more acquainted with triadic interactions involving objects and events in the world[74]. Crucially, the ostensive character of the deictic act (e.g., gaze shifts, pointing, demonstrations) appears to be a necessary condition for triggering such expectations in early childhood. Altogether, these studies empirically support the hypothesis that ostensive stimuli (b) prompt infants' inferences toward the content communicated by (c) eliciting expectations of relevance. In the next section, I discuss additional findings that shed further light on the nature of these early pragmatic inferences.

4.3. *Early relevance inferences*

What is the scope of young children's relevance-guided inferences? Whereas in Behne et al.'s study the inferential distance between the communicative cue (i.e., pointing to the bucket) and the intended meaning (i.e., "the toy is there") was relatively short, Schulze and Tomasello probed 18-month-olds' pragmatic inferences in a more challenging setting by increasing the distance between the ostensively-provided evidence and the content to be inferred[75]. In the familiarization phase, the experimenter (E1) and the in-

[74] Empirical studies on the "genericity bias" in imitative learning at 10 months of age (e.g., Judit Futó, Ernó Téglás, G. Gergely, G. Csibra, *Communicative function demonstration induces kind-based artifact representation in preverbal infants*, "Cognition", 117, 1, 2010, pp. 1-8) could suggest an earlier developmental pathway of enduring relevance expectations.

[75] Cornelia Schulze, M. Tomasello, *18-month-olds comprehend indirect communicative acts*, "Cognition", 136, 2015, pp. 91-98.

fant play with a "pling-machine" that produces funny sounds whenever small cubes are introduced. When no more cubes are available, the infant is guided to the opposite side of the room where there is a locked box that contains more cubes. Another experimenter (E2) shows a special key to the infant and demonstrates how to open the box with it by letting the infant practice the opening mechanism. After taking the remaining cubes from the box, E1 and the infant go back to play with the pling-machine on the opposite side, while E2 covertly fills the box with other cubes. When all cubes are introduced, E1 points this out to the infant, calls her name, and makes the special key visibly salient to the infant in different ways. In the *ostensive* condition, E1 holds the key up, alternates gaze between the key and the infant and places the key in front of her. In the *intentional* condition, E1 lets the key fall and marks this act as accidental by saying 'Oops'. Then, E1 retrieves the key and examines it quizzically without looking at the infant before placing it on the floor. In the *accidental* condition, E1 accidentally pushes the key toward the infant's direction while pointing to the pling-machine without looking at the infant or the key. Results show that half of the infants in the ostensive condition take the key, unlock the box, and retrieve further cubes to keep playing with the pling-machine, thus interpreting the ostensive showing of the special key as indirectly providing relevant information in the episodic context of the game (i.e., "here is the key; get more cubes from the locked box"). In the other two conditions, only 3 out of 40 infants used the key to open the box, despite all of them being previously familiarized with the key's function. Crucially, while the E1's actions are equally salient across conditions, ostensive signals are more likely to prompt inferences about the relevance of the showing gestures in the experimental context. This study shows that 18-month-olds can interpret ostensive showing as an indirect communicative act whose implicit meaning is relevant in the shared episodic context, thus providing further evidence about the importance of ostension in triggering early relevance-based interpretations of attended behaviors.

While the studies presented so far focus on infant-directed ostensive communication, there is indirect evidence that infants apply such relevance-based inferential heuristics also when they attend to ostensive interactions from a third-person perspective. In Tauzin and Gergely's looking-time studies, 13-month-olds are familiarized with videos showing self-propelled "flat-fishes" entities who interact in a turn-taking manner by exchanging sequences of sound triplets[76]. Then, infants see one agent (the addressee) repeatedly reaching for a ball that jumped back and forth into one of two boxes on either side of the scene. In the test phase, the addressee pushes the ball into

[76] Tibor Tauzin, G. Gergely, *Communicative mind-reading in preverbal infants*, "Scientific Reports", 8, 1, 2018, pp. 1-9.

the box and leaves without interacting with the second agent (the communicator). When only the communicator is present, the ball jumps into the opposite box; then, the addressee returns and interacts in a turn-taking way with the communicator, either via sound-sequences with varying melodic tones (variable-signals condition), or by contingently reproducing identical sounds (echo condition). After the interaction, the addressee approaches either the empty box where he left the ball or the correct one where it was just moved. Infants' looking times of these different outcomes are recorded and compared across conditions. In the variable-signals condition, infants look significantly longer (i.e., are surprised) when the addressee approaches the wrong box as compared to the correct one, while they look longer when the correct box is approached in the echo condition. This suggests that infants presumably take the contingent interaction with variable signals as providing the addressee with useful information about the new ball's location and expect the addressee to approach the correct box as a result of this informative exchange. By contrast, the turn-taking exchange of identical sounds does not trigger the inference that relevant information about the ball's location is being transmitted; hence, infants expect the addressee to search for the ball where she left it, as shown by looking times in the echo condition. This result provides indirect evidence that when infants observe ostensive contingent interactions from a third-party perspective, they draw context-based inferences about the communicated content as conveying information that is relevant in the context where a situational change related to the addressee's goal has just occurred, and they look surprised if the addressee acts in contrast with the presumed relevant information. Crucially, the variability of exchanged signals seems necessary for interpreting turn-taking interactions as involving relevant information transfer.

Taking stock, I have proposed that the hypothesis of a specialized processing mechanism for ostensive stimuli can be articulated from a developmental perspective by focusing on developmental data showing that ostensive behaviors (a) attract infants' attention, and (b) prompt infants' inference toward the conveyed content by (c) eliciting their expectations of relevance. Altogether, the studies discussed so far empirically support the hypothesis that infants spontaneously respond to ostensive stimuli according to these behavioral patterns. Crucially, these are jointly elicited only in ostensive conditions, thus supporting on empirical grounds their domain-specificity. Still, to fully vindicate PMH on developmental grounds, it remains to argue that these behavioral patterns are ultimately underpinned by a unique mental module.

5. *Pragmatics or pedagogy module?*

In developmental psychology, empirical data on early ostensive communication is typically assessed in relation to Csibra and Gergely's proposal for a Natural Pedagogy mechanism that fosters social learning in communicative contexts[77]. Natural Pedagogy fits harmoniously within Relevance Theory, but the complementarity of these two accounts raises the following question: How many cognitive modules should be posited to explain young children's behavioral responses to ostensive communication? One possibility, suggested (but not endorsed) by Moore[78], is to posit two distinct but complementary cognitive systems: the pedagogy module, responsible for detecting ostension and alerting the recipient *when* the communicator is acting upon a communicative intention, and the pragmatics module, which infers *what* the communicator is conveying via relevance-based heuristics. Here, I pursue a more parsimonious theoretical path by capitalizing on the previous sections. Preliminarily, let us briefly discuss the extent to which the two purported modules can be conceptually teased apart.

Natural Pedagogy is described as a human-specific adaptation that has facilitated the transmission of generic knowledge to naïve conspecifics. Csibra and Gergely[79] hypothesize that the birth of Pedagogy was necessitated by recursive tool-making practices in hominid groups, which required an efficient learning mechanism for transmitting unobservable knowledge about artifacts by way of ostensive-referential demonstrations of kind-relevant information, learned by naïve pupils and generalized as culturally shared. Natural Pedagogy was thus the 'cradle' of ostensive communication[80], and the "genericity assumption" was the primary bias characterizing hominids' interpretative abilities. Once the pedagogy mechanism became available, ostensive communication was extended beyond pedagogical purposes, thus providing efficient means of information transfer that eventually paved the way for language evolution. Without delving further into this evolutionary account, it is worth noticing that the pedagogy mechanism is here construed against the background of an Epistemic conception of modularity, that singles out an evolved mechanism by hypothesizing its adaptive value (e.g., tool-use) in ancestral times. This account diverges from Relevance Theory because the evolution of ostensive communication is traced back to pedagogical functions, rather

77 G. Csibra, G. Gergely, *Natural Pedagogy*, cit.

78 R. Moore, *Ontogenetic constraints on Grice's theory of communication*, in D. Matthews (Ed.), *Pragmatic development in first language acquisition*, John Benjamins, 2014, pp. 87-104.

79 G. Csibra, G. Gergely, *Natural pedagogy as evolutionary adaptation*, "Philosophical Transactions of the Royal Society", 366, 1567, 2011, pp. 1149-1157.

80 N. Mussavifard, *Metarepresenting in communication*, cit.

than cooperation and manipulation of others' mental states (cf. sect. 3[81]). Evolutionarily speaking, the purported pedagogy and pragmatics modules can be conceptually teased apart as discrete Epistemic modules posited by different evolutionary accounts, which single out different primary functions for ostensive communication. However, if we assess the pedagogy mechanism by looking at the algorithmic procedure that underpins its functioning, the two postulated mechanisms fall short of being clearly distinguishable. The main tenet grounding the Natural Pedagogy proposal is that ostensive behaviors elicit the presumption of optimal relevance in the recipient (i.e., the learner)[82]:

> This aspect of pedagogy […] is analogous to the communicative principle of relevance in verbal communication (Sperber & Wilson, 1986) in that it provides guidance for the learner in figuring out the knowledge content that he is supposed to acquire by the teacher's communication[83].

The genericity assumption which constrains the learner's interpretation of ostensive demonstrations is ultimately grounded on the presumption of optimal relevance because to fulfill its pedagogical function the relevance of acquired knowledge must be presumed and not verified by the learner. The genericity bias observed in developmental studies[84] can thus be conceived as a particular manifestation of the same interpretative heuristic guided, specifically, by expectations of *enduring* relevance about non-transient properties of novel objects. However, in contexts involving shared goals with the ostensive communicator, infants are able to interpret ostensive behaviors as vehicles of relevant episodic information[85]. From this perspective, the interpretative inference triggered by ostension can more parsimoniously be described as underpinned by the same relevance-based heuristic specialized for ostensive stimuli, whose output varies as a function of the nature of the pragmatic expectations that guide its operations according to infants' appraisal of the communicative context: *enduring* relevance about generalizable kind-related information to be acquired, and *episodic* relevance pertaining to information

[81] See also N. Mussavifard, G. Csibra, *The co-evolution of cooperation and communication: Alternative accounts*, "Behavioral and Brain Sciences", 46, e11, 2023.

[82] For a discussion on this point, see Emiliano Loria, *Learning through others. Natural pedagogy and mindreading: a possible cooperation*, Torino, Accademia University Press, 2020, pp. 24-28.

[83] G. Csibra, G. Gergely, *Social learning and social cognition: The case for Pedagogy*, in Y. Munakata, M.H. Johnson (Eds.), *Processes of change in brain and cognitive development*, Oxford University Press, 2006, p. 256.

[84] In K. Egyed, I. Király, G. Gergely, *Communicating Shared Knowledge in Infancy*, cit.

[85] In T. Behne, M. Carpenter, M. Tomasello, *One-year-olds comprehend the communicative intentions behind gestures in a hiding game*, cit.

about the 'here and now'[86]. In sum, the pedagogy mechanism which Csibra and Gergely describe as a discrete evolved adaptation on the backdrop of an Epistemic conception of modularity, can well be conceived, from an Algorithmic perspective, as underpinned by the same inferential procedure underlying the interpretation of ostensive stimuli in general, which can vary in pedagogical contexts as a function of the nature of the relevance expectations (i.e., enduring *versus* episodic) that drive its functioning[87].

Thus, how many cognitive modules should be posited to account for infants' behavioral responses to ostensive communication? In this section, I have merged the Pedagogy and the Relevance proposals under the hypothesis of a unique pragmatics module specialized for ostensive stimuli. Beyond theoretical parsimony, this account is based upon an Algorithmic conception of modularity which focuses on the actual processing mechanism (or algorithmic procedure) that underpins infants' interpretation of ostensive behaviors, rather than on the adaptive fitness of presumed Epistemic modules. According to this view, the pedagogy mechanism is ultimately underpinned by the same relevance-based heuristic that yields non-generic (i.e., episodic) pragmatic interpretations of ostensive behaviors; hence, the pedagogical function highlighted by Csibra and Gergely can well rely on the nature of the pragmatic expectations of relevance built into the pragmatics algorithmic module posited by Sperber and Wilson[88], without the necessity to postulate a different mental module.

6. *Conclusion*

Building upon Grice's idea that human communication is essentially intentional and inferential, Relevance Theory put forth a cognitive account of pragmatic comprehension that locates this capacity within the overall cognitive architecture of the human mind. In this paper, I have focused on Sperber

[86] The studies presented in this paper suggest that enduring relevance is elicited when the communicator's ostensive behavior occurs in a context that does not involve shared goals; instead, episodic relevance builds upon increasing shared motives in the familiarization phase of the task. However, the distinction between these expectations is not clear-cut (see H. Marno, G. Csiba, *Toddlers favor*, cit.; see sect. 4.2). More systematic studies that keep ostension constant while manipulating the context across conditions are needed to unravel how children distinguish cases in which the adult is communicating episodic information from cases where the adult is teaching.

[87] This conclusion is largely consistent with what is recently suggested in D. Sperber, D. Wilson, *Rethinking ostensive communication in an evolutionary, comparative, and developmental perspective*, https://doi.org/10.31234/osf.io/zp3fx, Draft May 2024.

[88] D. Sperber, D. Wilson, *Pragmatics, Modularity and Mind-reading*, cit.

and Wilson's[89] Pragmatics Module Hypothesis and argued that this hypothesis can be empirically supported by findings in developmental psychology. The Hypothesis centers upon the claim that pragmatic comprehension is underpinned by a relevance-guided inferential heuristic which is automatically and spontaneously recruited for processing ostensive stimuli (section 3). By elaborating on the domain-specificity of this purported "pragmatics module", I have spelled out the conceptual and empirical implications of the Hypothesis on developmental grounds, thus reconciling it with existing accounts of the cognitive mechanisms that support ostensive communication in infancy[90]. Specifically, I have argued that the hypothesis of a domain-specific, early-developing pragmatics module predicts that ostensive behaviors (a) attract infants' attention, and (b) prompt infants' inference toward the conveyed content by (c) eliciting their expectations of relevance, while these behavioral patterns are not jointly elicited by non-ostensive behaviors (section 4). Then, I have discussed a series of studies from infant pragmatics that support this prediction, thus shedding light on the context-specific nature of early relevance expectations (section 4.2) and highlighting the pivotal role of ostension in prompting infants' inferences toward the content (section 4.3). To conclude, I have drawn upon different conceptions of the modularity hypothesis (section 2) to argue that the reviewed data are more coherently (and parsimoniously) explained by hypothesizing a unique relevance-guided pragmatics module (section 5). The proposed account bridges theoretical approaches in cognitive pragmatics with empirical investigations on young children's proficiency with ostensive communication, thus highlighting the significance of turning to developmental research for unraveling open foundational questions in cognitive pragmatics.

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[89] *Ivi*.

[90] G. Csibra, *Recognizing Communicative Intentions in Infancy*, cit.

La Comunicazione Prelinguistica: Impegni e Intenzioni

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Abstract: There are at least two ways of thinking about human communication: either from a primarily social point of view, or from a psychological one. The dominant tradition in both the philosophy of language and in the cognitive sciences has privileged the psychological, assigning the explanatory place of pride to the notion of intention. In this essay, I argue that the dominant tradition has provided an adulterated picture of prelinguistic communication, which lacks the experimental support that it often claims to have. I will outline an alternative view based on the notion of shared commitment, and I will argue that this eminently social view can do better justice to both the experimental results and the reality of infancy, thus paving the way toward a more coherent picture of child development.

Keywords: Tomasello, Development, Commitment, Communicative Intention, Communication

1. *Due modi di pensare alla comunicazione*

Nel comunicare ci prendiamo impegni ed esprimiamo pensieri, emozioni e intenzioni. Nel prometterti che smetterò di fumare mi prendo un impegno nei tuoi confronti a smettere di fumare e, se sono sincero, esprimo anche l'intenzione di smettere di fumare. Una concezione matura della comunicazione dev'essere in grado di illuminare la relazione fra la dimensione sociale dell'uso di espressioni linguistiche, che fa riferimento agli impegni che gli interlocutori si prendono gli uni con gli altri[1], e quella per così dire psicologica, che fa riferimento all'espressione e al riconoscimento non solo di emozioni, ma soprattutto

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[1] Come tante altre parole 'impegno' è polisemica, e può essere impiegata per indicare, ad esempio, il grado di dedizione con cui si svolge un compito. In alcune delle sue accezioni, 'impegno' può indicare un attributo, anche psicologico. Nel presente lavoro seguo Geurts e uso 'impegno' in un'accezione fondamentalmente sociale, come spiegato nella sezione 3.

di 'attitudini proposizionali', come credenze e intenzioni[2]. A seconda di quale fra queste due dimensioni venga privilegiata, si avranno concezioni diverse della comunicazione e del significato, di come i bambini imparano a padroneggiare l'uso delle parole, e delle relazioni fra pensiero e linguaggio.

In molte aree della filosofia del linguaggio e delle scienze cognitive, la tradizione dominante è marcatamente psicologista, e si ispira alla teoria del significato di Paul Grice[3]. Secondo Grice, un proferimento è dotato di significato se e solo se il parlante lo produce *intendendo* sortire un effetto nell'interlocutore (ad esempio, che compia una certa azione, o che creda qualcosa), e intendendo inoltre che l'interlocutore riconosca questa intenzione. In maniera più schematica:

(i) Il parlante intende che l'ascoltatore creda che *p*.
(ii) Il parlante intende che l'ascoltatore riconosca che (i)[4].

L'intenzione a cui si fa rifermento in (ii) viene spesso chiamata *intenzione comunicativa*. La comunicazione ha successo quando l'ascoltatore riconosce le intenzioni che animano il comportamento del parlante, ossia (i) e (ii).

In psicologia dello sviluppo, la teoria del significato di Grice viene adottata in modi più o meno riconoscibili per spiegare come i bambini riescano a comunicare con successo a livello prelinguistico[5] e come possano imparare il significato delle parole[6]. In quest'ottica, la comunicazione, anche prelinguistica, consiste primariamente nell'espressione e nel riconoscimento di complessi di credenze e intenzioni. Pare dunque che i bambini debbano essere in grado di condurre sofisticati 'ragionamenti mentalistici' (ossia ragionamenti in merito a credenze e intenzioni) *prima* di, e *per*, imparare a parlare. La tesi negativa di questo saggio è che l'adozione della teoria del significato di Grice come teoria della comunicazione prelinguistica sia ingiustificata, e restituisca un'immagine artefatta sia della comunicazione che dello sviluppo del bambino.

[2] Bart Geurts, *Communication as commitment sharing: Speech acts, implicatures, common ground*, "Theoretical Linguistics", 45, 1-2, 2019, pp. 1-30.

[3] Cfr. *Meaning* (in Paul Grice, *Studies in the Way of Words*, Harvard University Press, Cambridge (MA) 1989, pp. 213-223), da non confondere con *Logic and Conversation* (*ivi*, pp. 22-40). Il primo è una teoria del significato del parlante, mentre il secondo è una teoria della nozione di 'implicatura'. Nonostante le apparenze, queste due teorie sono in larga misura indipendenti. L'obiettivo polemico del presente lavoro è l'adozione della teoria del significato come teoria della comunicazione prelinguistica.

[4] Per semplicità sorvolo sulla terza clausola.

[5] Cfr. Michael Tomasello, *Origins of Human Communication*, Harvard University Press, Cambridge (MA) 2008, e M. Tomasello *Becoming Human: A Theory of Ontogeny*, Harvard University Press, Cambridge (MA) 2019.

[6] Cfr. es. Paul Bloom, *How Children Learn the Meanings of Words*, MIT Press, Cambridge (MA) 2000.

L'alternativa principale è costituita da quelle teorie che in vario modo privilegiano la dimensione sociale. In psicologia dello sviluppo il nume tutelare è Lev Vygotsky, secondo cui le funzioni cognitive superiori, come ad esempio le capacità necessarie a svolgere ragionamenti mentalistici, si basano su interiorizzazioni di interazioni dialogiche[7]. In quest'ottica, l'acquisizione di una lingua e di competenze sociali di base preparano il bambino a ragionare in termini di credenze e intenzioni. L'ordine della spiegazione, dunque, è quello contrario rispetto alla tradizione Griceana.

La tradizione rappresentata da Vygotsky in psicologia viene spesso abbinata, in filosofia del linguaggio, a quella della pragmatica normativa, il cui rappresentante contemporaneo più eminente è Robert Brandom[8]. L'idea che anima la pragmatica normativa è che una spiegazione del significato (così come del contenuto proposizionale di credenze e intenzioni) debba basarsi su una ricognizione dell'uso delle parole nella comunicazione (di qui la dicitura di *pragmatica*). Tale ricognizione non può che essere effettuata in termini normativi, ossia in termini di *impegni* che i parlanti si prendono proferendo determinati enunciati. Il contenuto di questi impegni, e il significato degli enunciati, è determinato in primo luogo da ciò che conta come uso *corretto* delle espressioni linguistiche. In quest'ottica, l'avere un contenuto proposizionale di un pensiero non può venir spiegato indipendentemente da una ricognizione dell'uso corretto di quegli enunciati della lingua che possono venir impiegati per esprimerlo. Una conseguenza non ovvia di queste assunzioni sembra essere che il pensare a pensieri (o a intenzioni, credenze, e in generale un qualunque stato mentale caratterizzato da un contenuto proposizionale) è possibile solo per chi padroneggia l'uso di enunciati che li possono esprimere.

Il tallone d'Achille della tradizione socio-normativa è la mancanza di una concezione adeguata della comunicazione prelinguistica[9] che renda conto di come i bambini possano imparare il significato delle parole senza poter già fare affidamento a sofisticate capacità di ragionamento mentalistico. Il contributo positivo del presente lavoro è di gettare le fondamenta per colmare tale lacuna.

[7] M. Tomasello (cfr. es. *Becoming Human*, cit.) difende una teoria dello sviluppo umano neo-Vygotskyana, ma adotta una concezione Griceana della comunicazione prelinguistica. Queste due prese di posizione sono incompatibili. La soluzione che propongo è di adottare una concezione della comunicazione prelinguistica basata sulla nozione di impegno condiviso, che è coerente con il paradigma neo-Vygotskyano, e spogliarsi felicemente della concezione Griceana.

[8] Robert Brandom, *Making it Explicit: Reasoning, Representing, and Discursive Commitment*, Harvard University Press, Cambridge (MA) 1994.

[9] L'espressione "il tallone d'Achille" è intesa a indicare che la mancanza di una teoria della comunicazione prelinguistica è uno dei problemi centrali della tradizione socio-normativa (cfr. Ronald Loeffler, *Brandom*, Polity Press, Cambridge 2018) e quello fondamentale se si intende fornire una spiegazione dello sviluppo del bambino.

Come tanti, sono un nano abituato a salire sulle spalle di giganti. Qui come altrove, il gigante d'elezione è Bart Geurts[10], e il punto d'elevazione è costituito dalla sua concezione della comunicazione *linguistica* in termini di impegni condivisi. L'idea che anima il presente lavoro è che la comunicazione *prelinguistica* sia un fenomeno sociale nel quale il bambino gradualmente si prepara a condividere impegni con gli altri. In difesa di questa concezione argomenterò che, rispetto a quella 'Griceana'[11], fornisce una spiegazione più illuminante dei risultati sperimentali e restituisce un'immagine dello sviluppo del bambino più fedele alla realtà dell'infanzia.

Nel seguito mi concentrerò sul gesto dell'indicare, data la sua centralità nell'economia della comunicazione prelinguistica. Nella seconda sezione delineerò la spiegazione Griceana di come i bambini riescano a comunicare efficacemente indicando, e la contrasterò con una spiegazione basata sulla nozione di impegno condiviso. Nella terza sezione prenderò in esame i risultati di due esperimenti che si presume costituiscano prove in favore della concezione Griceana. Argomenterò che, in entrambi i casi, le speranze di fautori e sostenitori del programma sono destinate a rimanere deluse. Una spiegazione in termini di impegni condivisi risulta più illuminante, e rende quella Griceana superflua. Nella quarta e ultima sezione delineerò quale sia il ruolo di questa concezione alternativa della comunicazione in una più ampia concezione neo-Vygotskyana dello sviluppo del bambino.

2. *Indicare*

Il gesto di indicare viene spesso considerato una pietra miliare nello sviluppo del bambino[12]. Dall'età di un anno circa, se non prima, i bambini si rivolgono ad altri indicando persone, oggetti ed eventi, e prestano attenzione quando qualcuno indica qualcosa rivolgendosi a loro. Il gesto dell'indicare è particolarmente interessante perché può essere impiegato per dirigere l'attenzione di qualcuno su un qualunque aspetto dell'ambiente circostante

[10] Bart Geurts, *Making sense of self-talk*, "Review of Philosophy and Psychology", 9, 2, 2018, pp. 271-285; B. Geurts, *Communication as commitment sharing*, cit.; B. Geurts, *First saying, then believing: The pragmatic roots of folk psychology*, "Mind & Language", 36, 4, 2021, pp. 515-532.

[11] Nel seguito, userò espressioni come 'Griceana' per comodità espositiva, ma per ambizioni e sostanza, i lavori di Grice sono lontani da quelli di molti suoi seguaci. Per Grice, sia nella teoria del significato che in quella della conversazione, l'enfasi è su condizioni costitutive *razionali*, di contro a spiegazioni *causali*.

[12] In psicologia dello sviluppo, questo è un luogo comune e viene accettato anche da autori che pur si assestano su posizioni teoriche per molti versi contrapposte, come, ad esempio, M. Tomasello *Becoming Human*, cit. e Vasudevi Reddy, *How Infants Know Minds*, Harvard University Press, Cambridge (MA) 2008.

per una varietà di ragioni diverse. Ad esempio[13], il bambino può indicare la porta del bagno perché *si aspetta* che dopo cena la mamma lo porti come di consueto a lavarsi le mani. Oppure può indicare il bicchiere vuoto per *chiedere* che vi sia versata dell'acqua. In altre circostanze, può indicare il pupazzo che è saltato fuori dalla scatola perché ne è *meravigliato*, o il ragno che si arrampica sul muro perché ne è *spaventato*. Allo stesso modo, il bambino può rendersi conto che l'adulto ha indicato una certa scatola come il luogo in cui è nascosto un gioco, oppure una certa formina geometrica come il pezzo da inserire nel puzzle, e così via. In altre parole, il medesimo gesto può essere impiegato per comunicare, per così dire, contenuti diversi in circostanze diverse, anche da (e per) un bambino la cui limitata competenza linguistica ancora non gli consente di esprimere le proprie richieste, aspettative ed emozioni verbalmente, né di capire le espressioni verbali altrui. Il problema è spiegare come questo sia possibile.

2.1. *Intenzioni comunicative*

Michael Tomasello[14] fornisce una spiegazione in termini di intenzioni comunicative. L'adulto protende l'indice della mano in una certa direzione, alternando lo sguardo fra il bambino e quel che giace nella direzione in cui punta il dito. Il bambino riconosce a che cosa l'adulto intende fare riferimento ('intenzione referenziale') e perché ('intenzione sociale'), basandosi sul riconoscimento del fatto che l'adulto agisce con un'intenzione comunicativa. Dunque, in primo luogo il bambino riconosce che l'adulto intende che il bambino riconosca che l'adulto sta indicando qualcosa per una certa ragione. Sulla base di questo riconoscimento, il bambino inferisce a che cosa l'adulto intenda fare riferimento e perché, basandosi su quelle assunzioni che formano il loro contesto condiviso[15]. Queste assunzioni concernono, ad esempio, l'attività che stanno svolgendo insieme, la storia delle loro interazioni, quegli elementi dell'ambiente

[13] Gli esempi che seguono sono in larga parte tratti da osservazioni diaristiche contenute in M. Tomasello, *Origins of Human Communication*, cit.

[14] Cfr. M. Tomasello *Origins of Human Communication*, cit., e *Becoming Human*, cit.

[15] La nozione di 'contesto condiviso', a cui nelle discussioni in lingua inglese si fa spesso riferimento con la locuzione *common ground*, è un moderno vaso di Pandora. Viene spesso intesa in termini di conoscenza o credenza mutua (io so che tu sai che io so, etc., *ad infinitum*), o nozioni analoghe. Altrove ho sostenuto che tali concezioni sono incoerenti (Antonio Scarafone, *What would it be like for prelinguistic communication to be Gricean?*, "Language & Communication", 90, 2023, pp. 1-13), o nel migliore dei casi inapplicabili alla comunicazione infantile (A. Scarafone, *Joint Attention: Normativity and Sensory Modalities*, "Topoi", 43, 2024, pp. 283-294). Seguendo B. Geurts, *Communication as commitment sharing*, cit., ho argomentato che è meglio pensare al contesto condiviso come a una condizione normativa, ossia come una struttura formata da impegni condivisi. Per una disamina critica delle alternative disponibili sul mercato, si veda l'articolo di B. Geurts *Common ground in pragmatics* in corso di pubblicazione per Stanford Encyclopaedia of Philosophy.

circostante che sono particolarmente salienti per entrambi e così via.

Ad esempio, c'è un gioco in cui il ruolo dell'adulto è quello di nascondere la pallina in una scatola e il compito del bambino è di trovarla[16]. Il bambino non sa in che scatola guardare, così l'adulto indica quella in cui è nascosta la pallina. Il bambino (da una certa età in avanti)[17] riconosce che l'adulto sta agendo con un'intenzione comunicativa, ossia che non sta semplicemente allungando l'indice della mano, bensì con questo gesto, e l'alternanza dello sguardo fra la scatola e gli occhi del bambino, intende che il bambino riconosca che l'adulto intende riferirsi a una certa cosa per un certo motivo. Quali siano questa cosa e questo motivo dipende essenzialmente dalla natura del gioco che stanno giocando, dal fatto che abbiano o meno prestato attenzione insieme a certi aspetti dell'ambiente circostante, e da quali aspetti dell'ambiente siano di per se stessi salienti. Nell'esempio presentato, il bambino dunque capirà che l'adulto ha indicato la scatola (intenzione referenziale), anziché ad esempio il suo colore, e lo ha fatto per informare il bambino del luogo in cui si trova la pallina (intenzione sociale), anziché ad esempio per esprimere meraviglia nei confronti della foggia della scatola.

Nonostante la sua plausibilità intuitiva, la spiegazione fornita da Tomasello, così come altre spiegazioni di stampo Griceano, presenta una serie di problemi. Quelli principali, e relati, sono che: (i) la nozione di intenzione comunicativa non gioca un vero ruolo esplicativo e (ii) l'ordine della spiegazione è al contrario. Illustrerò questi due punti elaborando l'esempio della pallina nella scatola. L'esempio è una descrizione di una delle condizioni di un esperimento che si propone di verificare se i bambini (di 14 e 18 mesi di età) facciano affidamento sul riconoscimento di intenzioni comunicative. In due condizioni sperimentali, l'adulto indica o guarda la scatola mentre alterna lo sguardo con il bambino. Nelle altre due, l'adulto protende l'indice o guarda in direzione della scatola, ma questa volta mentre guarda distrattamente il proprio polso. Nelle prime due condizioni, i bambini tendono a cercare la pallina nella scatola indicata, mentre nelle altre due la cercano nell'una o nell'altra scatola, a prescindere dalla direzione in cui l'adulto indica o ha guardato. Pare, dunque, che a guidare la risposta del bambino sia il riconoscimento dell'intenzione comunicativa dell'adulto, ove l'agire con una tale intenzione viene operazionalizzato come fare qualcosa stabilendo un contatto

[16] Questo esempio si basa su un esperimento che discuterò nei capoversi successivi e condotto da Tanya Behne, Malinda Carpenter e Michael Tomasello, *One-year-olds comprehend the communicative intentions in a hiding game*, "Developmental Science", 8, 2005, pp. 492-499.

[17] L'età varia anche in base a quali oggetti sono coinvolti nel gioco. Questo è un aspetto problematico della teoria su cui mi soffermerò nei prossimi paragrafi. Nell'esperimento corrispondente all'esempio i bambini di 18 mesi non sembrano avere difficoltà, mentre quelli di 14 sembrano affascinati dalle scatole in quanto tali, e rimangono concentrati sul gesto dell'adulto solo se alle scatole vengono sostituiti contenitori senza coperchio.

visivo con l'interlocutore.

Nella spiegazione dei risultati sperimentali, la nozione di intenzione comunicativa è, in realtà, una ruota che gira a vuoto. È noto che i bambini, di preferenza, rivolgono la propria attenzione a ciò che giace nella direzione indicata se l'adulto ha stabilito un contatto visivo e ha alternato lo sguardo fra il bambino e l'oggetto[18]. Questa disposizione comportamentale del bambino contribuisce a far sì che sia possibile, per l'adulto, avere successo nel rivolgersi al bambino indicando qualcosa[19]. Il bambino può manifestare questa inclinazione senza già essere in grado di razionalizzare il comportamento comunicativo dell'adulto in termini di intenzioni e credenze. Ora, il bambino non si limita a guardare nella direzione indicata, bensì cerca la pallina nella scatola. Anche qui, non c'è bisogno di fare appello al riconoscimento di un'intenzione comunicativa. Il gioco consiste nel cercare una pallina che è stata nascosta in una scatola. Se il bambino ha familiarità con le scatole (sa come consentono di riporvi oggetti)[20], ed è motivato a cercare la pallina, il fatto stesso che di preferenza presti attenzione alla scatola indicata, in ragione del fatto che è stata indicata dall'adulto e in modo congruo al contesto condiviso, è sufficiente a spiegare perché il bambino tenda a cercare la pallina lì.

Nella sezione 2.2 elaborerò questa spiegazione alternativa nei dettagli, e renderò esplicita la sua struttura normativa. In breve, l'idea è che per rispondere in modo congruo all'adulto il bambino non ha bisogno di *sapere che* l'adulto intende che il bambino riconosca che l'adulto intende riferirsi alla scatola affinché il bambino cerchi la pallina lì dentro. Il fatto che il bambino disponga delle necessarie motivazioni, competenze pratiche[21] e *disposizioni relazionali* è sufficiente a spiegare i risultati sperimentali, ossia a spiegare perché i bambini, perlomeno dall'età di 18 mesi, di preferenza cerchino la pallina nella scatola indicata dall'adulto quando l'adulto la indica *rivolgendosi con gli occhi* al bambino, ma non quando protende l'indice facendo finta di controllarsi il polso.

Ora, 'di preferenza' non equivale a 'invariabilmente'. Le disposizioni ge-

[18] Si veda, ad esempio, Gergely Csibra, *Recognizing communicative intentions in infancy*, "Mind and Language", 25, 2, 2010, pp. 141-168. Come illustra Csibra, altre condizioni in cui i bambini di preferenza si orientano verso ciò che l'adulto ha indicato includono, ad esempio, l'uso di un tono di voce con cui di solito ci si rivolge ai bambini, e il fatto che l'adulto reagisca in modo contingente alle azioni del bambino. Ritornerò su quest'ultima condizione nella sezione 3.2.

[19] Che sembri esserci un'aspettativa 'referenziale' è di per sé interessante, e meriterebbe di essere spiegato in dettaglio, ma non è necessario fare ciò ai fini di questo saggio.

[20] Questa assunzione non è ovvia. Si veda la nota 17.

[21] Qui come altrove, faccio implicitamente riferimento alla nozione di conoscenza pratica per come è stata inizialmente difesa da Gilbert Ryle (1949) - *The Concept of Mind: 60th Anniversary Edition*, with a critical commentary by Julia Tanney, Routledge, New York 2009 - e in seguito ulteriormente sviluppata, specialmente in riferimento al problema di capire le intenzioni e le credenze altrui, in una serie di saggi da Victoria McGeer, *Mind-making practices: the social infrastructure of self-knowing agency and responsibility*, "Philosophical Explorations", 18, 2, 2015, pp. 259-281.

neralmente dimostrate dai bambini possono essere più o meno sviluppate e competere con altre disposizioni o motivazioni, portando i bambini a comportarsi in modo incongruo o strano, dalla prospettiva dell'adulto. Dunque, la spiegazione fornita (così come quella proposta in termini di intenzioni comunicative) può spiegare i risultati solo 'a parità di condizioni'[22].

A questo proposito, gli autori dell'esperimento notano un 'errore' curioso commesso da alcuni bambini, che pur si dirigono verso la scatola indicata dall'adulto, ma a metà strada vanno a cercare la pallina nell'altra scatola[23]. Gli autori propongono di spiegare questo comportamento nei termini di un corretto riconoscimento dell'intenzione referenziale (ossia, i bambini capiscono che l'adulto, indicando, intende riferirsi alla scatola) ma non dell'intenzione sociale (o 'informativa', ossia che l'adulto indica la scatola perché intende informare il bambino dell'ubicazione dell'oggetto). Questa interpretazione dell'errore è coerente con quella che gli autori propongono per interpretare i risultati, ma non può avvalorarla. Infatti, vi sono molte altre interpretazioni possibili, e non ci sono criteri interni all'esperimento per stabilire quali siano valide. Più in generale, le spiegazioni degli 'errori' negli esperimenti sono necessariamente *post hoc*: siccome gli errori non fanno parte dei risultati e non è possibile prevederli tutti, non ci sono criteri statistici o condizioni di controllo per determinare quali errori sono rilevanti e come interpretarli. Dunque, non ci si può avvalere di una certa interpretazione di un errore per avvalorare quella dei risultati. Al limite, l'errore può suggerire ulteriori esperimenti.

In questo caso, ad esempio, il bambino magari si dirige verso l'altra scatola perché ha già formato un piano motorio che è in grado di inibire solo temporaneamente, o perché intende 'provocare' l'adulto[24], o perché non assegna all'adulto il ruolo di aiutante, e così via. In altre parole, il bambino potrebbe avere disposizioni o motivazioni che competono con quella di rispondere adeguatamente all'atto comunicativo dell'adulto, e queste disposizioni potrebbero essere operative anche se il bambino avesse riconosciuto l'intenzione informativa dell'adulto. D'altra parte, il riconoscimento dell'intenzione referenziale congiunto al mancato riconoscimento dell'intenzione informativa non spiega perché il bambino inizialmente si dirige verso la scatola indicata anziché, ad esempio, limitarsi a guardarla.

Il primo problema con la spiegazione fornita da Tomasello è che la nozione di intenzione comunicativa non sembra svolgere alcun ruolo esplicativo genuino. Il secondo e più generale problema è che la spiegazione di Tomasel-

[22] Sono dell'opinione che il ragionamento pratico sia non-monotonico (cfr. R. Brandom, *Articulating Reasons*, Harvard University Press, Cambridge (MA) 2001). In altre parole, la clausola 'a parità di condizioni' è ineliminabile.

[23] Il punto che segue è importante, e ringrazio Edoardo Vaccargiu per avermi spinto a chiarirlo.

[24] Come si vedrà nella sezione 3.1, questo tipo di provocazione non è affatto raro.

lo, così come altre spiegazioni che tendono indebitamente a intellettualizzare il comportamento del bambino, sembra procedere al contrario. Infatti, è il possesso di certe disposizioni comportamentali che spiega come, in seguito, il bambino possa riuscire a razionalizzare il comportamento (altrui e proprio) in termini di intenzioni e credenze, non viceversa. Non c'è bisogno, e in certi casi non è proprio possibile, accedere a una razionalizzazione del comportamento *prima* di, e *per*, sapere come rispondere a questo comportamento in modo adeguato. Per riconoscere che l'adulto sta agendo con una certa intenzione, il bambino deve sapere che cosa l'adulto stia facendo o cercando di fare. Dato che il bambino ancora non parla, che cosa può garantirgli accesso a questa conoscenza? Presumibilmente, il fatto che quel comportamento appartenga al repertorio delle cose che il bambino stesso sa fare, o a cui sa come rispondere, o per cui ha imparato a riconoscere una risposta adeguata quando la vede. È questo tipo di conoscenza pratica, il saper fare, che apre la strada alla razionalizzazione, non viceversa.

D'altra parte, il comportamento del bambino è l'unico criterio disponibile per misurare la sua competenza comunicativa. Siccome questo comportamento si spiega in termini di conoscenza pratica, e il possesso di questa conoscenza non implica il possesso della conoscenza proposizionale corrispondente, la nozione di intenzione comunicativa risulta sistematicamente superflua, come illustrerò da un altro punto di vista nella sezione seguente. Non a caso, come ammesso (per altre ragioni) da svariati fautori del programma Griceano in scienze cognitive[25], non è ancora stata proposta un'operazionalizzazione soddisfacente della nozione stessa di intenzione comunicativa. Se non si dispone di una buona operazionalizzazione, non è chiaro quale esperimento *possa* dimostrare la tesi secondo cui i bambini agiscono con (e capiscono gli altri come animati da) intenzioni comunicative. Altrove[26] ho argomentato che la mancanza di un'operazionalizzazione soddisfacente non sia un caso, e che dipenda anche, fra le altre cose, da una concettualizzazione incoerente delle nozioni di intenzione comunicativa e contesto condiviso[27]. In breve, l'ipotesi secondo cui i bambini anche molto piccoli sono comunicatori Griceani non è un'ipotesi empirica genuina.

Un'obiezione che potrebbe essere sollevata a questo punto è che la no-

[25] Christoph Heintz, Thom C. Scott-Phillips, *Expression unleashed: The evolutionary and cognitive foundations of human communication*, "Behavioral and Brain Sciences", 46, 2022, e1.

[26] Cfr. A. Scarafone *What would it be for prelinguistic communication to be Gricean?*, cit. e A. Scarafone, John Michael, *Getting ready to share commitments*, "Topics in Philosophy", 50, 1, 2022, pp. 135-160.

[27] Nemmeno la proposta deflazionista di Richard Moore, *Gricean communication and cognitive development*, "The Philosophical Quarterly", 67, 2017, pp. 303-326, può avere successo, perché o non si qualifica come Griceana o, se lo fa, eredita gli stessi problemi della concorrenza. Fornisco una trattazione preliminare di questo problema in A. Scarafone, *Creating a Common Ground*, PhD thesis, University of Reading 2021.

zione di intenzione comunicativa, lungi dall'essere superflua, è ciò che rende unitaria la spiegazione della comunicazione prelinguistica. Il problema fondamentale è spiegare come i bambini, prima di aver imparato a parlare, riescano a comunicare e a capire una grande varietà di messaggi, tutti veicolati dal medesimo gesto (l'indicare) prodotto in circostanze diverse. Fare appello alla nozione di intenzione comunicativa sembra indispensabile per fornire una spiegazione unitaria di questo fenomeno. Infatti, potrebbe procedere l'obiezione, nonostante sia possibile spiegare ogni singolo esperimento senza fare riferimento alla nozione di intenzione comunicativa, fare ciò comporterebbe postulare un gran numero di abilità pratiche eterogenee, perdendo di vista ciò che vi è di unitario nel comportamento comunicativo del bambino.

L'unità che la nozione di intenzione comunicativa si propone di catturare è un'illusione. Se i bambini fossero in grado di ragionare in modo affidabile in termini di intenzioni comunicative in molte circostanze diverse, rimarrebbe da spiegare perché spesso, dal punto di vista degli adulti, siano buffi e commettano errori, e come non sia sempre facile capirli o farsi capire[28]. Presumibilmente la ragione è perché, rispetto a molte attività e aspetti del mondo, i bambini sono ancora inesperti o non competenti. Ma se si ammette questo, diventa chiaro che, per spiegare sia i loro successi che gli insuccessi, occorre fare riferimento a un insieme vasto ed eterogeneo di abilità pratiche che i bambini stanno ancora acquisendo. Quello di cui c'è bisogno, dunque, è una spiegazione unitaria di come e perché i bambini riescano a comunicare efficacemente *quando effettivamente lo fanno*, in ragione delle abilità che hanno acquisito e del contesto che condividono con gli adulti. Inoltre, occorre rendere comprensibile come i bambini possano *imparare* anche attraverso gli scambi comunicativi che hanno con gli altri, anziché arrivare allo scambio già dotati di tutte le conoscenze di cui hanno bisogno per razionalizzare il comportamento comunicativo dell'interlocutore. Questo è il compito della prossima sezione.

2.2. *Impegni condivisi*

Il primo mattoncino è una concezione alternativa del gesto dell'indicare stesso. Nella sua veste più semplice, la proposta è la seguente: nell'indicare qualcosa rivolgendosi a qualcuno, si condivide un impegno a prestare attenzione a quel qualcosa. La nozione di impegno qui in uso è quella elaborata da Geurts[29], e si tratta di una nozione normativa e primariamente sociale. È normativa perché prendersi un impegno vincola le azioni che si possono o si devono compiere

[28] In conversazione, Daniel Dennett mi ha aiutato a mettere a fuoco questo punto. Sembra ovvio, ma ha ripercussioni profonde, e filosofi e scienziati tendono a dimenticarsene.

[29] Cfr. B. Geurts, *Communication as commitment sharing*, cit.

e, in linea di principio, è sempre possibile mancare agli impegni presi. Posso prometterti che preparerò *pimientos rellenos de bacalao* per Pasqua e, se accetti la mia promessa, ho l'obbligo di preparare quel piatto, ove questo comporta procurarsi gli ingredienti necessari, assicurarsi di avere tempo, seguire la ricetta, e così via. Se mi dimentico, o non mi organizzo adeguatamente, o decido per conto mio che alla fine preparerò il *bacalao al pil pil*, ti spetta ritenermi responsabile. Il fatto stesso che te l'ho promesso ti legittima a reagire negativamente se per una ragione o per l'altra non mantengo la mia promessa, specialmente se mi avevi già detto che non ti piace l'aglio quando è tanto.

Di base, gli impegni persistono nel tempo finché non vengono ottemperati, rinegoziati o annullati, e le azioni che non si conformano agli impegni presi vengono in vario modo sanzionate. Per questo motivo, condividere impegni ci mette nelle condizioni di formare aspettative relativamente stabili in merito al nostro comportamento e a quello degli altri. Nella prassi, che queste aspettative siano perlopiù giustificate è indispensabile per coordinarsi efficacemente con gli altri oltre l'immediato presente. Infatti, sarebbe difficile coordinarsi nel tempo senza poter assumere che, anche solo perlopiù, le persone siano disposte o inclini a fare la propria parte, in modo congruo agli impegni presi.

Geurts cattura la dimensione sociale della nozione di impegno concependo l'impegno come una relazione fra due persone e un contenuto proposizionale, anziché come un attributo del soggetto. La notazione impiegata è la seguente: $C_{ab}p$, ove 'C' sta per impegno (*commitment*), '*a*' e '*b*' sono indici per gli individui, e *p* è il contenuto proposizionale. La promessa di preparare i *pimientos* è una promessa che faccio a te, e che mi impegna nei tuoi confronti ad agire conformemente alla proposizione secondo cui preparerò quel piatto. D'altra parte, affinché un impegno sussista, è necessario che tu lo accetti. Se rifiuti la mia proposta facendomi notare che sono un disastro ai fornelli, la promessa non vige, e non sono in dovere di preparare il piatto. Se invece la accetti, anche tu ti impegni, nei miei confronti, ad agire di conseguenza (semplificando: $C_{ba}p$). Sarebbe strano se, una volta d'accordo sul fatto che preparerò i *pimientos*, tu iniziassi a preparare altro, o andassi altrove per cena senza dire nulla, o iniziassi a ostacolarmi nella preparazione.

Nel caso normale, gli impegni vengono condivisi[30], nel senso che entrambi ci impegniamo, l'uno nei confronti dell'altro, ad agire conformemente ai dettami di una certa proposizione. Nella notazione prescelta: $C_{ab}p$ e $C_{ba}p$. L'inversione degli indici rappresenta il fatto che, condividendo un impegno, ci riteniamo responsabili a vicenda, e in questo modo possiamo formare aspettative affidabili gli uni nei confronti degli altri, e così coordinare effica-

[30] Per semplicità sorvolo sulla distinzione fra accettazione mutua e condivisione, che pure è un aspetto fondamentale della teoria di Geurts necessario a rendere conto di molti aspetti del disaccordo. Ringrazio Filippo Ferrari per un'utile discussione su questo punto.

cemente le nostre attività nel tempo. Secondo Geurts, la produzione di atti linguistici serve, primariamente, a condividere impegni al fine di coordinare attività. Non solo le promesse, ma anche le asserzioni, i comandi, le richieste, le offerte, e così via, sono tutte cose che facciamo insieme (gli impegni sono *condivisi*) al fine di coordinare le nostre attività e ragionamenti nel tempo. L'insieme degli impegni che condividiamo forma lo sfondo su cui si basano i nostri scambi comunicativi, e che questi costantemente aggiornano.

In generale, è possibile prendersi impegni senza saperlo o volerlo. Ad esempio, mi potrebbe capitare di richiedere un prestito in banca per acquistare una casa, e se mi trovassi nel Regno Unito mi potrebbe venir proposta una *home equity line*. Se firmo senza fare domande perché il nome suona bene, mi impegno comunque a pagare le rate del mutuo.

La possibilità stessa di prendersi impegni senza esserne pienamente consapevoli o senza già avere le competenze per ragionarci sopra è l'implicazione fondamentale per la comunicazione prelinguistica. Il bambino può impegnarsi, nei confronti dell'adulto, a prestare attenzione a qualcosa, anche se, ad esempio, il bambino non possiede ancora il concetto stesso di impegno, né le risorse concettuali per ragionare in merito al suo contenuto, o per derivarne conseguenze rilevanti. Ciò che determina se un impegno è stato preso è non solo la condizione epistemica o volitiva del soggetto, bensì, in primo luogo, l'esistenza stessa di una prassi e l'inclinazione dei partecipanti a comportarsi normativamente gli uni con gli altri. Sono queste disposizioni normative, e l'essere ricettivi alle disposizioni normative altrui, che mettono i bambini nelle condizioni di iniziare a condividere impegni e partecipare in modo sempre più competente alle attività condivise, anche *prima* di aver imparato a ragionare in merito a ciò che viene detto o fatto. Si può dunque spiegare come i bambini possano imparare molto di ciò che sanno anche attraverso le interazioni con gli adulti, senza disporre già delle conoscenze necessarie per razionalizzare il comportamento dell'adulto[31].

L'assunzione secondo cui è possibile prendersi un impegno 'senza saperlo' non va estesa oltre il dovuto. Affinché sia possibile condividere un impegno è necessario che esistano prassi regolate da quell'impegno, e che gli individui coinvolti siano partecipanti minimamente competenti. Infatti, un impegno è una relazione fra individui consenzienti, o che perlomeno sono in grado di accettare mutuamente l'impegno preso. Per contare come tale, l'accettazione richiede una comprensione, anche minima, di ciò che si sta facendo. Al livello più fondamentale, questa comprensione non consiste necessariamente nel possesso di segmenti più o meno estesi di conoscenza proposizionale (*sapere che*), bensì in un grado anche minimo di conoscenza pratica (*sapere come*). Per quanto riguarda i bambini, dunque, ci deve essere una fase in cui

[31] Tratto più approfonditamente di questo aspetto in A. Scarafone, *Joint Attention*, cit.

imparano a padroneggiare tipi di comportamento opportuno e iniziano così a dimostrare una qualche comprensione (anche minima) di quello che stanno facendo, affinché si possa dire, a pieno titolo, che condividono impegni.

Possiamo ora rivisitare l'esempio del bambino che cerca la pallina nella scatola. Il bambino e l'adulto condividono una serie di impegni: che l'adulto nasconda la pallina in una scatola, e che il bambino la trovi. Se l'adulto indica una scatola e il bambino è vigile, i due condividono anche un impegno a prestare attenzione alla scatola. In ragione degli impegni presi, 'prestare attenzione', qui, non significa solo guardare, bensì trattare la scatola come luogo in cui cercare la pallina[32]. Il bambino sa già come funzionano le scatole, e ha anche le disposizioni relazionali che consistono nel rispondere all'adulto orientandosi verso la scatola indicata. In altre parole, il bambino possiede le competenze per comportarsi conformemente agli impegni che condivide con l'adulto, ed è dunque in grado di comunicare efficacemente tramite il gesto dell'indicare, in questa e in altre circostanze simili. L'impiego della nozione di impegno è giustificato anche dal fatto che i bambini, perlomeno da quando hanno un anno e mezzo, non solo sono sensibili all'adozione di atteggiamenti normativi da parte di altri, ma loro stessi talvolta li adottano nei confronti di chi si comporta in modo difforme rispetto agli impegni presi[33].

In quest'ottica, il curioso 'errore' commesso da alcuni bambini può indicare che i bambini non hanno ancora tutte le risorse necessarie per mantenere l'impegno preso, o che hanno anche altre motivazioni in competizione con quella di ottemperare all'impegno. Questa caratterizzazione lascia la porta aperta a quali siano le risorse mancanti o le diverse motivazioni, il che è un bene, in quanto gli errori non fanno parte dei risultati degli esperimenti.

La spiegazione appena fornita si può generalizzare, così che il successo comunicativo consista, nel caso prelinguistico e almeno in primo luogo, nel sapere come comportarsi in modo da ottemperare agli impegni condivisi, ove questo presuppone l'aver acquisito o lo stare acquisendo ampi segmenti di conoscenza pratica[34]. In generale, è possibile prendersi impegni anche senza

[32] In *ivi* sviluppo anche una concezione della natura dell'attenzione congiunta e delle relazioni che vigono fra episodi di attenzione congiunta e contesto condiviso.

[33] In psicologia dello sviluppo c'è un mito persistente secondo cui è inadeguato parlare di normatività in riferimento a bambini che non hanno ancora tre anni. In collaborazione con John Michael (A. Scarafone, J. Michael, *Getting ready to share commitments*, cit.) abbiamo fatto del nostro meglio per sfatarlo.

[34] La flessibilità del comportamento del bambino è indice del possesso di conoscenza pratica (cfr. Ryle, *The Concept of Mind*, cit.) e di per se stessa non indica che il bambino possiede un'ulteriore conoscenza proposizionale. Inoltre, l'acquisizione di conoscenza pratica nell'ambito della regolamentazione delle attività condivise va di pari passo con l'acquisizione di una comprensione, seppur rudimentale, delle aspettative altrui. Il punto fondamentale è che questa comprensione (i) non equivale alla capacità di svolgere ragionamenti Griceani e (ii) non è un prerequisito per l'acquisizione di conoscenza pratica. Ringrazio un anonimo revisore per avermi incoraggiato a chiarire questo punto fondamentale.

sapere che ci si è presi certi impegni, o senza aver inteso farlo. A maggior ragione, è possibile condividere impegni, e comportarsi di conseguenza, senza ancora essere in grado di ragionare su che cosa l'interlocutore intenda che l'altro riconosca in merito alle sue intenzioni. Siccome l'unico criterio disponibile per valutare il successo comunicativo è il comportamento, e nel caso prelinguistico questo può sempre essere spiegato in termini di conformità a impegni e senza fare riferimento alla nozione di intenzione comunicativa, ne segue che la nozione di intenzione comunicativa è sistematicamente superflua per spiegare la comunicazione prelinguistica.

3. *Esperimenti*

Nella sezione precedente ho discusso diversi problemi della concezione Griceana e ho fornito un'alternativa in termini di impegni condivisi. In questa sezione, discuterò nel dettaglio due esperimenti che si candidano come prove in favore della concezione Griceana. Questa candidatura è da respingere, perché un'interpretazione Griceana dei risultati non solo è fuorviante, ma oscura la complessità e l'importanza dei risultati sperimentali.

3.1. *Il gioco del dare un oggetto*

Tomasello[35] fornisce una tassonomia degli atti comunicativi basata sui motivi per cui sono prodotti. Per quanto riguarda il gesto dell'indicare, la tassonomia consta di tre macrocategorie: espressivi (ad es., indicare qualcosa perché ne si è sorpresi), informativi (ad es., indicare un oggetto per informare l'interlocutore della sua ubicazione) e direttivi. Tomasello sostiene che i direttivi costituiscono un continuo che spazia dai comandi alle richieste cooperative. Nel comandare, il bambino intende che l'adulto faccia qualcosa, ad esempio che gli dia un oggetto, mentre nel produrre una richiesta cooperativa il bambino manifesta un bisogno o un desiderio e si aspetta che, riconoscendo la natura del bisogno espresso, l'adulto agisca in modo da soddisfarlo, se la richiesta è ragionevole. La prassi del richiedere si basa sul fatto che, di norma, ognuno dei due interlocutori assume che l'altro sia generalmente incline ad aiutare e condividere. Secondo Tomasello, è la natura marcatamente cooperativa delle richieste, così come di altri tipi di atti comunicativi, che le contraddistingue come parti di prassi comunicative specificamente umane. Tomasello presenta la distinzione fra comandi e richieste in termini di intenzioni comunicative. Nel comandare,

[35] M. Tomasello *Origins of Human Communication*, cit.; *Becoming Human*, cit.

(C) il bambino intende che l'adulto faccia una certa cosa.

Nel richiedere,

(RC) il bambino intende che l'adulto riconosca che il bambino intende che l'adulto faccia una certa cosa.

Ci sono diverse ragioni per dubitare della cogenza della tassonomia proposta da Tomasello, che meriterebbe di essere discussa più approfonditamente. Nel seguito, mi occuperò della tesi, sostenuta da Tomasello[36] e altri[37] secondo cui l'esperimento di Grosse e colleghi[38] dimostrerebbe come i bambini, all'età di 18 mesi e anche prima di aver imparato a parlare, producano richieste cooperative nel senso sopra indicato. In questo esperimento, l'adulto fa finta di non capire la richiesta del bambino, ma per quel che sembra un caso fortuito, fornisce al bambino l'oggetto richiesto. In questa condizione, i bambini tendono comunque a ripetere la loro richiesta. Dunque, concludono gli autori, nel produrre una richiesta i bambini non sono motivati solo dall'ottenere l'oggetto, bensì anche dall'intenzione che la loro intenzione di ottenere l'oggetto venga riconosciuta. Nel seguito, argomenterò che questa interpretazione non è giustificata, e di fatto offusca l'importanza dei risultati.

Nell'esperimento, il bambino e l'adulto (lo sperimentatore) siedono da parti opposte di un tavolo, e giocano una serie di giochi, ognuno dei quali consiste nel mettere quattro oggetti al posto giusto. Ad esempio, c'è un puzzle in cui quattro figure geometriche vanno riposte negli appositi vani di un puzzle. In un altro gioco, c'è un elefantino che si deve preparare per una passeggiata e deve calzare le quattro scarpine. In questi giochi, il ruolo dell'adulto è quello di porgere al bambino un oggetto alla volta, e il compito del bambino è quello di usarlo in modo appropriato. Per ogni oggetto dal primo al terzo, l'adulto lo porge al bambino con entusiasmo e partecipazione, nominando l'oggetto che porge e chiedendo, ad esempio, "in che buco va la pallina?". In ogni gioco, il quarto oggetto apparentemente manca, e il bambino è invitato da un altro adulto (l'assistente) a richiedere l'oggetto mancante allo sperimentatore, il quale fa finta di essere impegnato in qualcos'altro mentre tiene l'oggetto nella mano destra.

In una condizione (*Corretta*), lo sperimentatore semplicemente soddisfa la richiesta del bambino e gli porge l'ultimo oggetto. In un'altra condizione (*Caso Fortuito*), l'adulto si rivolge verso uno scaffale alle proprie spalle, su cui c'è un oggetto del tutto privo di interesse, come un ritaglio di cartone, e fa finta di fraintendere la richiesta, come se il bambino volesse il ritaglio di cartone. Nel

[36] *Ivi*.

[37] Cfr. es. Thom C. Scott-Phillips, *Speaking our minds: Why human communication is different, and how language evolved to make it special*, Red Globe Press, London 2015.

[38] Gerlind Grosse, Malinda Carpenter, Michael Tomasello, Tanya Behne, *Infants communicate in order to be understood*, "Developmental Psychology", 46, (6), 2010, pp. 1710-1722.

frattempo, però, mette l'oggetto giusto su un punto del tavolo che il bambino può facilmente raggiungere. Secondo gli autori, in questa condizione la richiesta del bambino verrebbe fraintesa e poi soddisfatta 'per caso', siccome l'oggetto desiderato si trova a portata di mano. In *Caso fortuito*, metà dei bambini più piccoli (18 mesi) tendono a ripetere la loro richiesta, ad esempio indicando l'oggetto di cui hanno bisogno o nominandolo, mentre guardano l'adulto, nonostante questo oggetto si trovi già a loro disposizione. Dunque, concludono gli autori, questi bambini non solo intendono che l'adulto dia loro il pezzo del gioco, bensì intendono anche che l'adulto riconosca questa loro intenzione.

Il problema è che la descrizione della condizione *Caso Fortuito* è fuorviante. Il fatto che l'oggetto si trovi a disposizione del bambino non implica che il bambino abbia ottenuto ciò che si aspettava di ottenere, o che la sua richiesta sia stata soddisfatta. Il bambino si aspetta che l'adulto gli *dia* l'oggetto, così come ha fatto per tutti e tre gli oggetti precedenti. Senza il gesto del dare, non è chiaro agli occhi del bambino se, ad esempio, la richiesta sia stata accolta, o se gli sia concesso di usare l'oggetto che si trova ad avere a disposizione, o se l'adulto stia ancora giocando. L'adulto si sta comportando in modo strano, e per gestire le proprie aspettative in merito al suo comportamento, il bambino ripete la richiesta. La ripetizione della richiesta certamente risponde a un'incongruenza ed è un tentativo di riparare uno scambio comunicativo che non è andato a buon fine, ma non implica che il bambino intenda che l'adulto riconosca che il bambino intende che l'adulto gli porga l'oggetto. Ancora una volta, la nozione di intenzione comunicativa non gioca nessun ruolo esplicativo. È una ruota che gira a vuoto.

Non è difficile dimostrare l'importanza rivestita dal gesto del dare, per i bambini come per gli adulti. Anche prima di iniziare a indicare, verso i 10 mesi di età, i bambini spesso partecipano al gioco, talvolta fine a se stesso, dell'offrire e ricevere oggetti. Ad esempio[39], stiamo prendendo il caffè e il bambino offre un biscotto al nonno. Il nonno sorride, ringrazia, e porge il palmo della mano per ricevere il biscotto, che il bambino gli porge, sempre alternando lo sguardo fra la mano, il biscotto, e gli occhi del nonno. Spesso, dopo aver imparato a padroneggiare questa routine, i bambini talvolta offrono oggetti, ma, non appena l'altro accetta l'offerta ("Oh! Un altro biscotto! Grazie!"), ritirano la mano e si mettono a ridere. Lo stesso accade se quello che viene dato è un abbraccio anziché un oggetto e se i ruoli sono invertiti fra chi offre e chi accetta. Che i bambini abbiano aspettative precise riguardo alla differenza fra il mero prendere un oggetto e l'accettare un'offerta, sia in prima persona che quando osservano interazioni in terza persona, è testimoniato da diversi esperimenti, e a diversi livelli di spiegazione[40]. Nell'esperimento di

[39] L'esempio è adattato da un'osservazione riportata in V. Reddy, *How infants know minds*, cit.

[40] Denis Tatone, Gergely Csibra, *The representation of giving actions: Event construction in the service of monitoring social relationships*, "Current Directions in Psychological Science", 33, 3, 2024, pp. 159-165.

Grosse e colleghi, l'importanza del gesto del dare è testimoniata anche dal fatto che, in un'altra condizione sperimentale in cui l'adulto finisce per dare al bambino l'oggetto privo di interesse, il bambino talvolta lo accetta[41].

L'interpretazione di questi risultati sperimentali in termini di impegni non è difficile da immaginare. Condividiamo un impegno a giocare un gioco che coinvolge alcuni oggetti. Il tuo ruolo è quello di porgermi ognuno di questi oggetti uno alla volta e, visti i precedenti, mi aspetto che tu lo faccia in un certo modo. All'ultimo oggetto, le mie aspettative vengono disattese, dunque indico l'oggetto (*x*) che si suppone tu mi porga. Nell'indicare l'oggetto rivolgendomi a te, cerco di condividere un impegno che consiste nel prestare attenzione all'oggetto indicato, e quel che significa 'prestare attenzione a *x*' è determinato dagli impegni che abbiamo condiviso nel corso di questa attività. In risposta, tu fai qualcosa di strano: *accetti* di darmi un altro oggetto (*y*), non me lo dai, e nel frattempo metti l'oggetto giusto sul tavolo. Sono confuso e indico di nuovo l'oggetto, perché, ad esempio: (i) non so se *posso* prendere *x* (che non hai mai accettato di darmi); (ii) non so come procede il gioco d'ora in avanti; (iii) alla fine non mi hai dato l'oggetto *y*, che pure hai accettato di darmi, e così via.

Questo esperimento fornisce risultati non banali ed è interessante per diversi motivi, ad esempio perché rivela modi non ovvi in cui il comportamento dell'adulto, inclusa l'attenzione alle richieste, l'accettazione, e così via, sia importante agli occhi del bambino. Un'interpretazione dei risultati sperimentali in termini di impegni condivisi raggiunge due obiettivi. Primo, mostra in che modo gli atti comunicativi servano in primo luogo a regolare la partecipazione ad attività condivise, e come vengano usati con successo a seconda delle competenze, pratiche e comunicative, possedute da entrambi gli interlocutori, e dalla storia delle loro interazioni. Secondo, facendo ciò mostra come la nozione di intenzione comunicativa sia non solo superflua bensì fuorviante, perché nasconde, anziché spiegare, la complessità delle interazioni comunicative dei bambini. Ad esempio, glossa su come la natura della richiesta e i tentativi di ripararla dipendano sia dalla storia delle interazioni fra il bambino e l'adulto fino a quel momento, che dalla competenza con cui il bambino è in grado di giocare al gioco del dare e ricevere oggetti.

3.2. *Credere per sentito dire*

Un'altra serie di esperimenti che si propongono di fornire prove a favore del programma Griceano è quella ad opera di Tibor Tauzin e György Ger-

[41] Convenientemente, gli autori dell'esperimento hanno escluso questi risultati dall'analisi statistica. Ci sono altri aspetti assai dubbi dell'esperimento, che per ragioni di spazio sono costretto a discutere altrove.

gely[42]. Nel seguito, argomenterò che gli esperimenti di Tauzin e Gergely possono gettare luce su come i bambini arrivino ad attribuire credenze formate sulla base della testimonianza, ma non hanno nulla a che fare con il riconoscimento di intenzioni comunicative.

Nell'esperimento principale, al bambino viene mostrato un filmato in cui una figura animata di colore Blu posiziona una pallina in una di due scatole, in presenza di un'altra figura animata di colore Giallo. Blu lascia la scena, e in sua assenza la pallina si sposta da una scatola all'altra sotto gli 'occhi' di Giallo. Al suo ritorno, Blu si orienta verso Giallo ed emette tre triplette di segnali. In una condizione, che possiamo chiamare *Ripetizione* (*1*), Giallo si limita a fare l'eco, ossia a ogni tripletta di segnali emessa da Blu, Giallo risponde con la stessa tripletta di segnali, emessi nello stesso ordine. Nell'altra condizione, che possiamo chiamare *Differenza* (*2*), Giallo fa l'eco alla prima tripletta, ma risponde alla seconda o alla terza emettendo una sequenza di segnali diversa. Gli autori sostengono che in *Differenza* Giallo informi Blu sull'ubicazione della pallina, mentre in *Ripetizione* Giallo non risulti informativo.

Queste assunzioni richiedono qualche chiarimento. In entrambe le condizioni, la prima tripletta di segnali emessa da Blu viene echeggiata da Giallo. Secondo gli autori, questa eco iniziale è necessaria affinché il bambino percepisca gli agenti come impegnati in uno scambio comunicativo che verte su qualcosa. Chiamerò questa assunzione SCAMBIO (SC). Inoltre, sempre secondo gli autori, percepire questo scambio equivale a percepire gli agenti come impegnati a esprimere e riconoscere intenzioni comunicative. Chiamerò questa ulteriore assunzione INTENZIONE COMUNICATIVA (IC). L'assunzione SC, mettendo fra parentesi alcuni dettagli di formulazione, è del tutto plausibile. Come ho notato in precedenza, è stato dimostrato che se un agente reagisce in modo contingente ai loro gesti, sguardi o vocalizzazioni, i bambini tendono a interagirci con piacere, e formano aspettative specifiche riguardo ai gesti 'referenziali' dell'agente, ossia quei gesti con cui l'agente presumibilmente fa riferimento a qualcosa (ad esempio, se l'agente guarda o indica in una certa direzione, i bambini guardano in quella direzione aspettandosi di trovarci *qualcosa*)[43]. I bambini formano aspettative analoghe quando, invece di essere direttamente coinvolti nello scambio, osservano due agenti che reagiscono in maniera contingente l'uno alle azioni dell'altro. Nel contesto del video mostrato nell'esperimento, si presume che il bambino attribuisca a Blu lo scopo di riprendersi la pallina[44], e lo spostamento della pallina stessa è l'even-

[42] Tibor Tauzin, György Gergely, *Communicative mind-reading in preverbal infants*, "Scientific Reports", 8, 9534, 2018, pp. 1-9.

[43] Si vedano i risultati sistematizzati e discussi in G. Csibra, *Recognizing communicative intentions*, cit.

[44] Questa assunzione sembra convalidata, almeno in parte, da ulteriori esperimenti riportati

to saliente nella sequenza di immagini. Dunque, sembra lecito suppone che, agli occhi del bambino, se avviene uno scambio ed è informativo, esso verta sull'ubicazione della pallina.

Il problema è con l'assunzione IC, ossia con la conclusione secondo cui, agli occhi dei bambini, la reattività contingente indica la presenza di intenzioni comunicative. L'essere sensibili alla reattività contingente di un interlocutore rispetto a un altro è una precondizione (fra tante) sia per comunicare efficacemente che per percepire due agenti come impegnati in uno scambio comunicativo. Queste sono (o possono essere) le funzioni del percepire la reattività contingente a prescindere dal fatto che lo scambio comunicativo venga percepito come Griceano o meno[45]. Dunque, nulla implica che, se un soggetto percepisce la reattività contingente come segno di un'interazione comunicativa, il soggetto attribuisce anche intenzioni comunicative agli interlocutori. Nella migliore delle ipotesi, le disposizioni comportamentali con cui i bambini manifestano una qualche sensibilità alla reattività contingente sono parte di ciò che li mette nelle condizioni, in seguito, di razionalizzare il comportamento di chi è impegnato in uno scambio comunicativo.

Rimane da spiegare perché, secondo gli autori, i segnali emessi da Giallo in *Ripetizione* non sono informativi, mentre quelli emessi in *Differenza* sì. Seguendo Shannon[46], gli autori argomentano che, se una sequenza di segnali è del tutto prevedibile dal ricevente, tale sequenza non può essere informativa e, viceversa, una sequenza di segnali può essere informativa solo se non è interamente prevedibile. Gli autori assumono inoltre che questa condizione di prevedibilità sia soddisfatta se il segnale ricevuto in risposta a *ognuna* delle *tre* triplette è identico a quello emesso[47].

Dunque, il bambino percepisce la prima eco come l'inizio di uno scambio comunicativo, e le successive risposte come potenzialmente informative. Inoltre, il bambino attribuisce a Blu lo scopo di riprendersi la pallina, e il movimento della pallina è l'unico evento saliente a cui assiste Giallo. Dunque, agli occhi del bambino, se lo scambio è informativo allora verte sull'ubicazione della pallina. Di conseguenza, il bambino si aspetta che, se Blu viene

nell'articolo di Tauzin e Gergely.

[45] Come hanno mostrato, ad esempio, le analisi della comunicazione a opera di Nick J. Enfield, *How We Talk. The Inner Workings of Conversation*, Basic Books, New York 2017 e V. Reddy, *How Infants Know Minds*, cit.

[46] Claude E. Shannon, *A Mathematical Theory of Communication*, "Bell System Technical Journal", 27, 3, 1948, pp. 379-423.

[47] Il modo in cui ho scelto di rendere esplicita l'assunzione degli autori richiede un chiarimento. Il fatto che il segnale di risposta alla prima tripletta sia identico a quello inviato non implica che sia interamente prevedibile (meglio, ridondante), e dunque non informativo. Infatti, la prima eco segnala l'inizio di un'interazione. Però, se come risposta a *ogni tripletta* si ricevono *solo eco*, la prevedibilità (ridondanza) della sequenza è alta, e il contenuto informativo è corrispondentemente basso.

informato allora cercherà la pallina nella scatola in cui essa effettivamente si trova, e il bambino è sorpreso se Blu cerca la pallina dove l'aveva lasciata. Viceversa, se Blu non viene informato, il bambino si aspetta che Blu cerchi la pallina dove l'aveva lasciata, e sarà sorpreso in caso contrario. L'esperimento consta dunque di quattro condizioni sperimentali (due congrue, in azzurro, e due incongrue, che dovrebbero destare sorpresa, in rosso):

Differenza	*Ripetizione*
1a. Blu è informato e si dirige verso la scatola che contiene la pallina.	*2a*. Blu non è informato e si dirige verso la scatola che contiene la pallina.
1b. Blu è informato e si dirige verso la scatola in cui aveva lasciato la pallina.	*2b*. Blu non è informato e si dirige verso la scatola in cui aveva lasciato la pallina.

Gli autori assumono che, se il bambino rimane a guardare la scena significativamente più a lungo in una condizione rispetto a un'altra (ad es., *1b* VS *1a*), allora il bambino è sorpreso di fronte agli eventi che si verificano in quella condizione. Secondo le analisi degli autori, i bambini tendono a guardare lo schermo significativamente più a lungo in *1b* VS *1a*, e in *2a* VS *2b*. Se la differenza nel tempo per cui il bambino rimane a guardare lo schermo è un indice affidabile della sorpresa, e assumendo anche che le altre assunzioni degli autori sono valide, allora ci sono prove in favore dell'ipotesi iniziale, ossia che i bambini anche molto piccoli attribuiscono all'agente credenze formate sulla base della testimonianza.

L'aspetto geniale di questo esperimento è che, impiegando interazioni comunicative non linguistiche, apre una strada per indagare alcune delle precondizioni per attribuire credenze formate sulla base della testimonianza. Ora, alcune delle assunzioni degli autori non sono ovvie, così come non è ovvio che il bambino concettualizzi uno scambio potenzialmente informativo in termini di credenze basate sulla testimonianza. Inoltre, i risultati ottenuti in questo esperimento non sono ancora stati replicati, ed è dunque necessaria una certa cautela. Ai fini del presente articolo, il punto importante è che, anche se i risultati venissero replicati e le perplessità in merito alle assunzioni degli autori venissero fugate, i risultati dell'esperimento non direbbero nulla in merito al possibile riconoscimento, da parte del bambino, di intenzioni comunicative. Infatti, come si è visto, l'assunzione INTENZIONE COMUNICATIVA è una ruota che gira a vuoto, non svolge alcun ruolo esplicativo. Prima di passare alla sezione conclusiva, è bene svolgere il ragionamento che porta a questa conclusione per intero.

Il bambino riconosce che vi è uno scambio comunicativo (SC). Assumen-

do inoltre che il bambino riconosce che, se gli ulteriori segnali di risposta sono diversi da quelli emessi, allora lo scambio è informativo (*Differenza*) e verte sull'ubicazione della pallina, si aspetta che l'agente si diriga verso la scatola in cui la pallina effettivamente si trova. D'altra parte, se il bambino riconosce che, se i segnali sono solo echi allora lo scambio non è informativo (*Ripetizione*), il bambino si aspetta che l'agente si rechi verso la scatola in cui ha lasciato la pallina. L'assunzione SCAMBIO (annidata, a seconda dei casi, in *Differenza* o *Ripetizione*) è sufficiente a spiegare i risultati, e non ne segue che il bambino riconosce che gli agenti esprimono e riconoscono intenzioni comunicative (IC). Dunque, IC è un'assunzione superflua. In altre parole, la reazione del bambino (qualunque essa sia) non dice nulla sul fatto che il bambino 'legga' l'interazione fra Blu e Giallo in termini di intenzioni comunicative o meno. Dunque, questi risultati sperimentali, a prescindere dal fatto che vengano replicati o meno, non costituiscono una prova in favore della tesi che i bambini percepiscono gli scambi comunicativi in termini di intenzioni comunicative.

4. *Una concezione neo-Vygotskyana*

Secondo la concezione Griceana della comunicazione prelinguistica, il ragionamento mentalistico, ossia il ragionare in termini di credenze e intenzioni, è necessario per comunicare a livello prelinguistico e per arrivare a padroneggiare una lingua. Nelle sezioni precedenti, ho argomentato che la concezione Griceana presenta diversi problemi concettuali, e che non ci siano (né probabilmente ci possano essere) prove sperimentali in suo favore. L'alternativa che difendo è di concepire la comunicazione prelinguistica in termini di impegni condivisi, e lo sviluppo del bambino come il diventare gradualmente più preparato a condividere impegni con altri. Questa concezione alternativa evita i problemi concettuali di quella Griceana, e fornisce anche interpretazioni migliori dei risultati sperimentali. In quest'ultima sezione, illustrerò brevemente il ruolo della concezione della comunicazione prelinguistica come condivisione degli impegni in una più ampia spiegazione neo-Vygotskyana dello sviluppo del bambino, secondo cui le funzioni cognitive superiori si basano su un'interiorizzazione delle interazioni dialogiche.

Si può argomentare che la comunicazione serva, in primo luogo, a regolamentare la partecipazione ad attività condivise[48], e che assolve a questa funzione perché comunicando, specialmente producendo atti linguistici, ci prendiamo impegni gli uni con gli altri[49]. I bambini diventano partecipanti sempre più com-

[48] Herbert J. Clark, *Using Language*, Cambridge University Press, Cambridge (MA) 1996.
[49] B. Geurts, *Communication as commitment sharing*, cit.

petenti in una miriade di attività condivise diverse, imparando anche a regolare la propria e altrui partecipazione a queste attività in base agli impegni presi. La conoscenza richiesta è in primo luogo una conoscenza pratica, e include inclinazioni a comportarsi normativamente nei confronti degli altri. È perfettamente possibile diventare partecipanti competenti, comportarsi in base agli impegni presi e aspettarsi che gli altri facciano altrettanto, senza essere già in grado di ragionare in merito a ciò che gli altri credono o intendono. Ovviamente, la strada da percorrere per spiegare in dettaglio come il bambino possa passare dalla comunicazione prelinguistica alla produzione di atti linguistici veri e propri è ancora lunga e sarà probabilmente tortuosa, ma c'è ogni ragione per credere che possa essere percorsa senza fare appello al ragionamento mentalistico.

Una volta che il bambino abbia acquisito competenze pratiche, sociali e comunicative di base, e dunque una qualche dimestichezza con gli atti linguistici più semplici, diventa possibile, per il bambino, impiegare questi strumenti linguistici per regolare le proprie attività individuali, anche quando è da solo. Non è raro che, ad esempio, il bambino si astenga dal toccare i fornelli caldi seguendo l'ingiunzione del genitore ("Non toccare i fornelli!") e che, in seguito, resista alla tentazione di toccare i fornelli ripetendo ad alta voce, a se stesso, "Non toccare i fornelli!"[50].

Da un punto di vista psicologico, la proposta di Tomasello[51] è quella di spiegare questa dinamica come un processo imitativo a ruoli invertiti: nel ripetere il comando, il bambino assume verso se stesso il ruolo che il genitore aveva assunto nei suoi confronti. Seguendo Geurts[52], se nel rivolgere un atto linguistico a qualcuno arriviamo a condividere un impegno con il nostro interlocutore, possiamo dire che nel rivolgerci a noi stessi producendo un atto linguistico ci prendiamo un *impegno con noi stessi*. Questi impegni per così dire privati non sono altro che intenzioni e credenze sotto (neanche tanto) mentite spoglie: un'intenzione è un impegno privato il cui contenuto specifica un obiettivo, come smettere di fumare, mentre una credenza è un impegno privato il cui contenuto non specifica alcun obiettivo, ma ciononostante vincola normativamente le azioni del soggetto, come ad esempio il credere che mi è rimasta ancora una sigaretta nel pacchetto.

Una volta che il parlare a se stessi sia stato concettualizzato in termini di impegni privati, e fra questi vengano distinte intenzioni e credenze, non rimane da spiegare come, sulla base delle competenze acquisite, sia possibile imparare ad attribuire intenzioni e credenze a se stessi e agli altri, e dunque a ragionare in questi termini. Dal punto di vista dello sviluppo del bambino, e nonostante esistano centinaia di esperimenti e svariate teorie, questa parte della storia è

50 B. Geurts, *Making sense of self-talk*, cit.; M. Tomasello, *Becoming Human*, cit.
51 B. Geurts, *Communication as commitment sharing*, cit.
52 Id., *Making sense of self-talk*, cit.

ancora piuttosto lacunosa. Geurts[53] offre una storia coerente dal punto di vista evolutivo. L'idea centrale è che, una volta acquisito l'uso corretto di verbi per parlare di ciò che viene detto (*meta-talk*) è anche possibile parlare di ciò che gli altri dicono a se stessi. Ogni lingua nota possiede almeno alcuni verbi metadiscorsivi (come 'dire', 'parlare', e così via), che sembrano anche essere fra i verbi più utilizzati. Seguendo percorsi di cambiamento lessicale assodati dalla linguistica storica, è possibile spiegare le transizioni fra il resoconto *verbatim* di ciò che è stato detto e la parafrasi, nonché la differenziazione fra le intenzioni e le credenze del parlante. In altre parole, assistendo a ciò che qualcuno dice a se stesso, e se siamo in grado di riferire ciò che questa persona dice a se stessa, abbiamo acquisito un modello in base al quale attribuire a questa persona intenzioni e credenze. E lo stesso modello può essere utilizzato, ovviamente, per ragionare in merito alle credenze e alle intenzioni che noi stessi abbiamo. In altre parole, abbiamo imparato a pensare a pensieri.

In conclusione, esiste un modo per spiegare come, diventando sempre più competente nel prendere impegni, comportarsi di conseguenza, e aspettarsi che gli altri facciano altrettanto, il bambino possa anche parlare a se stesso per regolare le proprie attività e ragionamenti, e in seguito diventi in grado di ragionare in merito a ciò che gli altri credono e intendono. È dunque possibile invertire l'ordine della spiegazione prediletto dalla tradizione Griceana e colmare importanti lacune della tradizione inaugurata da Vygotsky, secondo cui le funzioni cognitive superiori si basano sull'interiorizzazione di interazioni dialogiche.

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[53] B. Geurts, *First saying, then believing*, cit.

Labelling and Categorization: Evidence from Experimental Studies on Infants

Mara Floris*

Abstract: In recent decades, cognitive psychology has focused on the impacts of linguistic labels on the categorization processes in infants. In this article, the results of two experimental studies, Plunkett *et al.*[1] and Althaus and Westermann[2], are critically analyzed in the context of the experimental literature on this topic. From the analysis, it is possible to identify two effects of language labels on categorization: a "grouping effect" and a "segregation effect". These effects are interpreted within a broader debate on language and thought in which Linguistic Relativity and the debate on the Cognitive Penetrability of Perception are interconnected. Within this framework comes the Language Feedback Hypothesis[3] as a theory that could account for the effects observed experimentally both on infants and adults.

Keywords: Language, Categorization, Infants, Linguistic Relativity, Cognitive Penetration

1. *Introduction*

The investigation into how language and categorization intertwine in early childhood has intrigued cognitive psychologists and psycholinguists since the late 20th century. With more than twenty experimental studies sharing similar methodologies, this research domain aims to clarify the role of word-image associations in the learning and acquisition of categories. This article delves into these issues through the lens of experimental studies employing

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1 Kim Plunkett, Joan-Fan Hu, Leslie B. Cohen, *Labels can override perceptual categories in early infancy*, "Cognition", 106, 2, 2008, pp. 665–681.

2 Nadja Althaus, Gert Westermann, *Labels constructively shape object categories in 10-month-old infants*, "Journal of Experimental Child Psychology", 151, 2016, pp. 5-17.

3 Gary Lupyan, *Linguistically modulated perception and cognition: The label-feedback hypothesis*, "Frontiers in psychology", 3, 2012, A54.

the novelty preference task[4], predicated on the observation that children exhibit a greater interest in novel stimuli over familiar ones, thereby allowing inferences about their categorical distinctions based on preference.

The present article adopts a minimalist definition of categorization as the sorting of objects into groups, sidestepping the need to attribute representational content to infant categories beyond their visual properties[5]. This cautious approach addresses, but does not fully engage with, the debated impact of linguistic labels on conceptual development[6]. While the interplay between labels and categorization is acknowledged as potentially foundational to concept learning, this paper does not aim to exhaustively explore this complex relationship. Despite the academic discourse often blurring *concepts* and *categories* this paper maintains a clear distinction.

The concept of 'concept' itself is broadly used yet ambiguously defined in cognitive science. Machery critiques the prevailing definitions and suggests replacing the notion of 'concepts' with more specific terms like 'prototype' 'exemplar', and 'theory', defining concepts as a body of information about something stored in long-term memory and commonly employed in cognitive processes resulting in judgments about that thing[7]. This does not imply, however, that infants categorizing objects necessarily possess 'concepts' of those objects, underscoring that categorization - merely classifying objects based on observable characteristics - does not equate to having stable conceptual categories.

Categorization emerges as a basic cognitive ability, not unique to humans but shared across the animal kingdom, pivotal for understanding the studies at hand. It's crucial to distinguish between conceptual and perceptual categories, a difference emphasized by Mandler[8]. Experimental approaches thus far have focused on infants' responses to the physical aspects of objects, indicating that categorization at this stage is predominantly perceptual. Although this suggests infants might develop perceptual categorization prior to conceptual reasoning, it doesn't rule out their conceptual capabilities. This paper posits that conceptual frameworks may not be essential for explaining infant categorization.

[4] Carmel Houston Price, Satsuki Nakai, *Distinguishing novelty and familiarity effects in infant preference procedures*, "Infant and Child Development: An International Journal of Research and Practice", 13, 4, 2004, pp. 341-348.

[5] Nicholas Shea, *Naturalising representational content*, "Philosophy Compass", 8, 5, 2013, pp. 496-509.

[6] Susan Carey, *The origin of concepts*, "Journal of Cognition and Development", 1, 1, 2000, pp. 37-41.

[7] Eduard Machery, *Concepts are not a natural kind*, "Philosophy of Science", 72, 3, 2005, pp. 444-467; E. Machery, *Doing without concepts*, Oxford University Press, 2009; E. Machery, *Précis of doing without concepts*, "Behavioral and Brain Sciences", 33, 2-3, 2010, pp. 195–206.

[8] Jean M. Mandler, *Foundations of mind. Origins of conceptual thought*, Oxford University Press, 2007, pp. 121-145.

Furthermore, while many psychologists view labelling as a facilitator of categorization, the specifics of this effect are not universally agreed upon. The novelty preference task often used in these studies involves introducing infants to a category of visual stimuli, followed by a test phase presenting a familiar and a new image. Increased attention to the new image suggests recognition of the familiar one. The experimental challenge lies in comparing labelled versus unlabeled stimuli to discern labels' specific effects on categorization, a task complicated by the frequent absence of a "silence control condition". This paper, therefore, focuses on two studies deemed reliable in determining labels' impact on categorization: Plunkett *et al.*[9] and Althaus and Westermann[10], emphasizing the need for direct comparison between labelled and unlabeled stimuli to clarify labels' roles.

2. *The Experiments in Plunkett, Hu and Cohen's article*

The stimuli employed by Plunkett et al. were composed of illustrations depicting rudimentary animals. Each animal shares a basic body and facial structure (comprising two circles) but differs in the characteristics of their legs, necks, ears, and tails. Variations include the length of the legs and neck, the thickness of the tail, and the spacing between the ears. Each characteristic could take on one of five possible values (labelled from 1 to 5), making every animal a unique combination of these four numerical values. The study featured two distinct experimental scenarios: the Broad Condition and the Narrow Condition. In the Broad Condition, the combination of features was unrestricted. In contrast, the Narrow Condition imposed correlations between certain traits (for instance, long necks were consistently paired with short legs, and the reverse), as illustrated in Fig. 1.

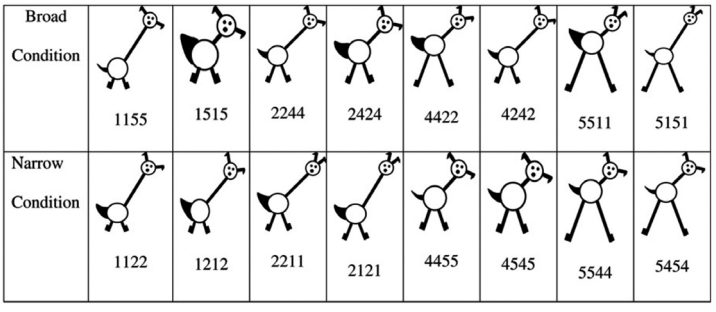


Fig. 1. The Broad Condition and The Narrow condition in Plunkett *et al.* (2008).

9 K. Plunkett et al., *Labels can override*, cit.

10 N. Althaus, G. Westermann, *Labels constructively shape objects*, cit.

The stimuli used in the test phase, which immediately follows the familiarization, are new animals: the overall prototype (3333), the extreme exemplar with low values (1111) and the one with high values (5555), see Fig. 2.

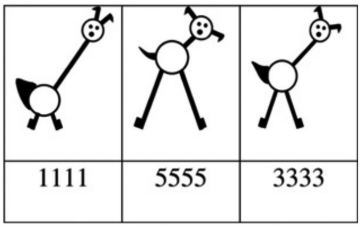


Fig. 2. The test stimuli used by Plunkett *et al.*

They conducted 5 experiments, as reported in Table 1.

Experiment 1	Experiment 2	Experiment 3	Experiment 4	Experiment 5
Broad Condition	Narrow Condition	Narrow Condition	Narrow Condition	Narrow Condition
Silence	Silence	2 consistent labels	2 random labels	1 label
1 category	2 categories	2 categories	No categorization	1 category

In the initial experiment, 24 infants were acquainted with the Broad Condition in silence (mean age 10 months 9 days, range 9 months 21 days to 10 months 12 days). At the testing phase, they exhibited a preference for objects with extreme values (1111/5555) over the median prototype (3333), which serves as the category's prototype. The observation that the extreme examples were recognized, drawing more attention, while the prototype garnered less viewing time, is interpreted as evidence that the objects introduced during the familiarization phase are acknowledged as belonging to the same category. The increased attention to the extreme objects suggests they were perceived as novel. Conversely, in the Narrow Condition, the pattern of preferential looking time was reversed: following exposure to the Narrow Condition stimuli, infants demonstrated longer viewing times for the prototype (3333) rather than the extreme examples (1111/5555). Each extreme example, in terms of geometric similarity, was closer to one of the Narrow Condition's categories and, expectedly, was not the preferred object during testing. Instead, the prototype was deemed more interesting, indicating the recognition of two categories but an uncategorized perceptual space between

them. These initial experiments were pivotal in demonstrating that stimulus manipulation could result in the recognition of one or two categories, contingent on the stimuli with which they were familiarized.

The paper conducted detailed statistical analyses to assess the impact of labelling on infant category formation. During the familiarization phase, a mixed model ANOVA was used to compare the mean looking times of infants across different experimental conditions and blocks. This analysis revealed significant main effects for both the experiment factor ($F(4,115) = 24.886$, $p < .001$) and the block factor ($F(1, 115) = 31.891$, $p < .001$), indicating that the presence of auditory stimuli (labels) increased overall looking time and that infants' attention decreased over time due to habituation. Specifically, infants in the auditory conditions (Experiments 3–5) spent more time looking at the familiarization stimuli compared to those in the silent conditions (Experiments 1 and 2), with significant differences found through post hoc comparisons ($p < .001$).

In the test phase, infants' novelty preferences were analyzed using two-tailed t-tests to determine the proportion of time spent looking at the average stimulus (3333) versus the extreme stimuli (1111 or 5555). Significant preferences were found in several experiments: infants exposed to broad condition stimuli (Experiment 1) preferred the extreme values ($t(23) = -2.99$, $p = .007$), while those in the narrow condition (Experiment 2) preferred the average value ($t(23) = 2.55$, $p = .018$). In Experiment 3, where labels correlated with visual categories, a significant novelty preference for the average stimulus was observed ($t(23) = 2.55$, $p = .018$), mirroring the results of Experiment 2. However, random label assignment in Experiment 4 led to no significant novelty preference ($t(23) = 0.11$, $p = .912$), indicating disrupted category formation. In Experiment 5, the use of a single label resulted in a significant preference for the extreme values ($t(23) = -2.70$, $p = .013$), similar to Experiment 1, demonstrating the label's overriding effect on category formation. Effect sizes (Cohen's d) were reported to quantify the magnitude of differences, and overall, the statistical analyses confirmed that labels could modulate and override perceptual category formation in infants.

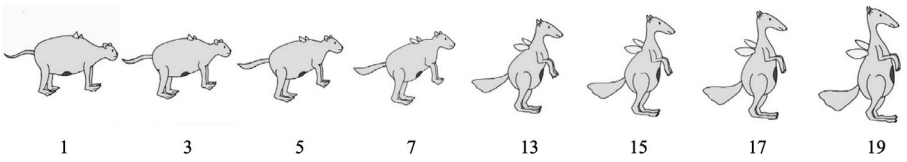
The third experiment replicated the second, but the stimuli were associated with two consistent labels: one subcategory of the Narrow Condition was labelled "rif," and the other "dax." The addition of these auditory cues did not alter the novelty preference task outcome: the subdivision within the Narrow Condition persisted. In contrast, the fourth experiment involved pairing the stimuli with the same two labels from the third experiment in a pseudo-random manner, thereby dissolving any direct association between the subcategories and labels. This misalignment disrupted the previously established categories, with choices at the test phase not deviating from randomness.

The fifth experiment offers a compelling insight into the impact of labels on visual categorization: when stimuli from the Narrow Condition were accompanied by a single label, the outcomes aligned with those from the first experiment, which involved the Broad Condition stimuli. Utilizing one label resulted in the formation of a single category, suggesting that labelling a group of perceptually distinct objects (which in silence are categorized as two separate categories) with the same name leads to them being perceived as members of the same category. This phenomenon, herein referred to as the "grouping effect," aligns with the intuitive notion that if diverse objects are referred to by the same name, they are considered part of the same category.

3. *The experiments in Althaus and Westermann*[11]

A contrasting phenomenon is observed in the more recent research conducted by Althaus and Westermann. They developed a set of stimuli that, in the absence of sound, is perceived as a single category but can be divided into two distinct categories when the stimuli are systematically associated with two labels. The stimuli consisted of animal drawings produced using morphing software, resulting in a series of images that blend two distinct animals along a continuum. Rather than manipulating individual features of these animals, the variations between each image were holistic, as illustrated in Fig. 3.

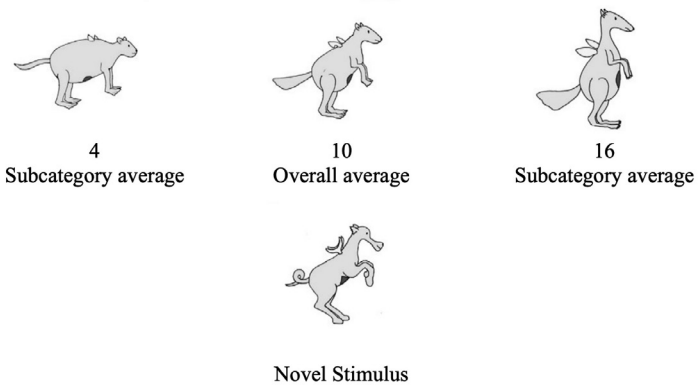
Fig. 3. The stimuli used in the familiarization phase by Althaus and Westermann.



Similar to the Narrow Condition employed by Plunkett and colleagues, Althaus and Westermann's stimuli could be segmented into two subcategories, achieved by introducing a gap within the continuum of morphed stimuli. Their testing procedure was more intricate than that used by Plunkett and colleagues. To eliminate the possibility of a familiarity effect, they conducted comparisons between the overall prototype, the prototypes of the two subcategories, and then contrasted these with a novel stimulus[15], as depicted in Fig. 4.

[11] N. Althaus, G. Westermann, *Labels constructively shape objects*, cit.

Fig. 4. The test stimuli in Althaus and Westermann



In this study, statistical analysis was employed to understand how labelling affects object categorization in 10-month-old infants. Initially, objects presented without sound were perceived as a single category, with the overall average stimulus recognized as familiar. This perception remained unchanged when a single label was applied to all stimuli. However, introducing two distinct labels for two subcategories resulted in infants perceiving the category as divided, with the overall average stimulus attracting more attention. To assess this, a mixed two-way ANOVA compared average looking times across conditions (silent, one-label, two-label) and blocks (first four vs. last four trials). Significant main effects were observed for condition ($F(2,60) = 15.357$, $p < .001$) and block ($F(1, 60) = 14.563$, $p < .001$), indicating longer looking times in the labelling conditions and a decrease over time, showing familiarity. Additionally, preference scores from test trials were analyzed using a mixed effects ANOVA, revealing that two distinct labels led to infants perceiving the stimuli as belonging to two categories ($F(2,59)= 4.96$, $p = .010$, unlike non-linguistic sounds which had no such effect. This contrasts with findings by Plunkett *et al.*[12], where objects without auditory cues were viewed as a single category, but applying two different labels changed this perception, causing the stimuli to be categorized separately.

12 K. Plunkett, N. Althaus, G. Westermann, *Labels constructively shape objects*, cit.

4. *Interpretation of the effect*

Prior to delving into the implications of these findings, as well as comparing and contrasting the two studies with the broader research landscape, it's pertinent to address the limitations of the novelty preference task and the conceptualization of category utilized herein. The novelty preference method hinges on the observation that infants devote more attention to novel items over familiar ones, a phenomenon first documented by Fantz[13]. Despite its widespread application within psychological research, ambiguities surrounding the habituation paradigm persist. For instance, there's evidence suggesting that infants may exhibit a preference for familiarity if the habituation period is inadequate, with younger infants particularly showing a tendency towards familiar stimuli when faced with complex scenarios[14]. Nonetheless, even accepting that the novelty preference observed in the aforementioned studies wasn't merely an experimental artefact and is considered reliable, this doesn't fully address the methodological concerns associated with this approach. The novelty preference task offers an indirect, rather than a direct, measure of categorization, merely indicating when one stimulus is perceived as more novel relative to another, without providing a direct assessment of categorization itself.

It's important to note that in Plunkett's experiments, the stimuli used during testing to assess the two potential subcategories were novel extreme examples. Conversely, in Althaus' experiments, the tested stimuli were the prototypes of the two subcategories. When presented in silence, Plunkett's stimuli appear to divide into two categories: the extreme stimuli seem more familiar than the prototype, which attracts more attention. This suggests a perceptual gap between the two categories. Introducing a label seems to bridge this gap: the prototypical item becomes recognized as familiar, and it's plausible that all items spanning the gap between the two categories are similarly recognized. However, the data do not clarify whether the two extreme examples are categorically included. The novelty preference task, by comparing two objects, indicates only which is perceived as more novel, not definitively categorizing the less novel object. Thus, this task provides only a relative preference between two items, with any conclusions about categorical inclusion or exclusion being indirectly inferred. If an object centrally located within the category is deemed more novel than the extremes, it indicates a gap. Yet, if an extreme object – situated at the category's periphery – is preferred over the prototype, its categorical status remains ambiguous.

[13] R.L. Fantz, *Visual Experience in Infants: Decreased Attention to Familiar Patterns Relative to Novel Objects*, "Science", 146, 3644, 1964, pp. 668-670.

[14] Leslie B. Cohen, *Uses and Misuses of Habituation and Related Preference Paradigms*, "Infant and Child Development", 13, 4, 2004, pp. 349-352.

The data do not definitively reveal what occurs at the category boundaries.

For the very same reason, when in the silent condition of Althaus' experiments the overall average prototype is considered more familiar than the two subcategory prototypes it just means that there is no gap between them, it is plausible to think that the two subcategory prototypes are included in the category. In the two labels case, the labels make the overall average item appear unfamiliar and, presumably, other intermediate items as well. This reverse pattern deserves more attention as it opens some interesting future research questions. The Narrow Condition in Plunkett's experiments is specifically designed to obtain two categories. Plunkett and colleagues reproduced the same stimuli used by Younger[15]. Younger invented them to test whether infants could exploit correlation of attributes to create new categories. Their original purpose was to test the so-called "Correlated attribute hypothesis" according to which natural categories are not arbitrary, but they carve-up the world according to clusters of features[16]. Younger and colleagues discovered that infants could actually exploit correlations among attributes, or, at least, they found that the stimuli they created were naturally divided into two groups. What is surprising is that the stimuli used by Althaus and Westermann are not naturally segregated into two categories. If we look at the way the stimuli are created, we can notice that, as they morph two images, they have the entire perceptual continuum of the stimuli and that they deliberately decided to leave a big gap in the middle. They took only one every two morphed animals, and they discarded the five animals in the middle[17].

This big gap between the two groups of stimuli is meant to guarantee two categories, but it is not the case. The stimuli, in silence, are considered as a single category. Whatever are the principles that control the way infants categorize, Plunkett's Narrow Condition is split into two categories, and Althaus' stimuli are not, even if they were meant to be so. It would be interesting to investigate this kind of phenomena further. The other interesting future development of these data concerns the nature of the novelty preference procedure itself and the role of prototypes. In Althaus' experiments, in silence, the overall prototype was considered more familiar than the two subcategory prototypes. This result is surprising because the two subcategory prototypes are closer to the examples seen during the familiarization phase and the overall prototype, instead, is relatively far from them. This experiment seems to show that prototypical effects on categorization are so strong that even if

[15] Barbara A. Younger, *The segregation of items into categories by ten-month-old infants*, "Child Development", 56, 6, 1985, pp. 1574-1583.

[16] Douglas L. Medin, Edward E. Smith, *Concepts and concept formation*, "Annual Review of Psychology", 35, 1, 1984, pp. 113–138.

[17] N. Althaus, G. Westermann, *Labels constructively shape objects*, cit.

infants do not see items close to the prototype, not only they recognize it as familiar, but it is also considered as more familiar than two items closer to the already seen examples. More research is needed to shed light on these questions: what drives natural categorization?

How could an unseen prototype be more familiar than seen examples?

Concerning the grouping effect, there is a study which seems to show a similar result despite the methodological differences. Landau & Shipley[18] tested three groups (2-year-olds, 3-years-olds and adults) with the same set of stimuli consisting of pictures of two "standard" objects and six objects created by morphing the initial two along a continuum; they were randomly assigned to the Same Label or Different Labels condition. Participants first observed two "standard" objects either called by the same name ("This is a blicket") or with two different names ("This is a blicket/steb"). They were then exposed to the novel stimuli, those in the Same Label condition were asked if the object was a blicket and those in the Different Label condition were asked if it was a blicket or a steb. In the Same Label condition, participants were likely to call all the objects by the same name. In the Different Label condition, the name was generalized only to the most similar examples. Even if the age groups and the procedure are different compared to Plunkett's and Althaus' studies, this study shows that when two objects are given the same name, all the intermediate objects, with respect to perceptual similarity, are considered members of the same category. These findings corroborate the idea that calling perceptually different objects by the same name yields to the filling of the perceptual gap between them, although it is worth noticing that this experiment due to its research design lacks a silent control condition.

5. *"Grouping Effect" and a "Segregation Effect"*

The reason why only the two already mentioned studies have been considered is that they are the only studies in which it is clear that a label can modify the shape of a category that can be formed in silence. To my knowledge, in the existing literature, this requirement has not been fulfilled[19]. It is true though that there is a substantial body of empirical research on this topic, as mentioned in the previous section. The lack of a silent control condition makes the evaluation of the previous research at least uncertain; nonetheless, the analysis in the previous section on the kind of auditory stimuli that may

[18] Barbara Landau, Elizabeth Shipley, *Labelling patterns and object naming*, "Developmental Science", 4, 1, 2001, pp. 109–118.

[19] Mara Floris, *Language and categorization in infancy*, Aracne, Roma 2022.

affect categorization leads to a positive conclusion. As reported in Ferguson and Waxman[20], a comparison of existing studies suggests that if there is an effect of labels (specifically count nouns) on categorization, this effect depends on the fact that they are names, not merely sounds. This finding sheds light on the experiments in which there was a comparison between a Label condition and a No-Label condition. If we accept that only labels have an effect, at least after a certain age, the experiments in which there is a condition in which stimuli were paired with a sentence, but without a label, could be considered significant.

Only a few experiments fulfil these requirements: they have to be conducted with infants older than 10 months because before that age the facilitative effects could depend on language broadly conceived, and there must be a comparison between a condition with a label and a condition without a label[21]. Experiments comparing sounds and words cannot be considered because of a possible overshadowing effect of sounds[22]. Even if these experiments are acceptable from the point of view of the comparison among different kinds of auditory stimuli, their experimental set-up is not adequate to describe what is the exact effect on categorization. Their results seem to prove that some forms of categorization are not available without a label: it is not possible to measure any preference at test in the condition without a label, the category is recognized only when a label is present. What is surprising is that during the test one of the two items always belongs to a completely novel category, for example in Waxman and Markow[23] infants (n= 32; with ages ranging from 9.3 to 20.1 months; mean age: 13.5 months) are familiarized with a set of dinosaurs and the two items of the test are a new dinosaur and a fish. This result, compared with the existing literature, is quite hard to interpret; the interpretation according to which the category "dinosaur" was not recognized without a label is weak. It is plausible to think that it is recognized even in silence, but for some reason, the fish is preferred at test only when there is a label.

[20] Brock Ferguson, Sandra R. Waxman, *Linking language and cognition in infancy*, "Journal of Child Language", 44, 3, 2017, pp. 527-552.

[21] M. Floris, *Language and categorization*, cit. p. 20.

[22] Anne L. Fulkerson, Robert A. Haaf, *Does object naming aid 12-month-olds' formation of novel object categories?*, "First Language", 26, 4, 2006, pp. 347-361; Robert A. Haaf, Anne L. Fulkerson, Brandon J. Jablonski, Julie M. Hupp, Stacey S. Shull, and Lisa Pescara-Kovach, *Object recognition and attention to object components by preschool children and 4-month-old infants*, "Journal of Experimental Child Psychology", 86, 2, 2003, pp. 108-123; Sandra R. Waxman, Dana B. Markow, *Words as invitations to form categories: Evidence from 12-to 13-month-old infants*, *Cognitive Psychology*, 29, 3, 1995, pp. 257-302.

[23] S.R. Waxman, D.B. Markow, *Words as invitations*, cit.

Another possibility is that the stimuli used by Waxman and Markow[24] induced some sort of "superordinate-level" categorization, and the stimuli used by Plunkett *et al.* and Althaus and Westermann kept categorization at a "basic-level". The perceptual variability in the latter studies is relatively low. It is not implausible to think about them as items belonging to the very same basic category. In Waxman and Markow's studies, instead, the animals used during the familiarization phase are quite different from each other. Maybe the perceptual variability among the dinosaurs is so high that there is a novelty preference only when a label highlights their belonging to the same category. Basic level categories, instead, are easier to detect. The novelty preference procedure only tells what item is perceived as more interesting; it does not mean that no categorization occurred.

The existing studies indicate that it is possible to describe a "grouping effect" and a "segregation effect" at least in some circumstances. The role of labels, so far, is to increase or decrease the perceived similarity. Therefore, if some items share the same name, they may be considered as belonging to the same category. If some other items without any auditory stimulus look quite similar, but they have different names, they may belong to different categories. Further research is needed to discover whether labels can group only some items which already are quite similar and if labels can segregate relatively dissimilar items. In other words, we still have to understand if there is something like a threshold of similarity which limits the power of labels. It may be that the similarity induced by labels interacts with visual similarity.

6. *Linguistic Relativity*

The discussion around how language labels impact children's categorization inevitably leads to a broader debate on the influence of language on thought: the "Sapir-Whorf Hypothesis" or "Linguistic Relativity". This theory suggests that the language we speak shapes our thoughts. The widespread interpretation of this hypothesis indicates that language affects cognitive processes. However, the theory's specifics remain somewhat ambiguous; even the term "Sapir-Whorf Hypothesis" is somewhat of a misnomer. Edward Sapir and Benjamin Lee Whorf never jointly proposed the theory, although Sapir was Whorf's mentor. While Sapir's impact on Whorf's ideas is undeniable, Whorf formulated the hypothesis independently, hence it is sometimes more accurately referred to as the Whorfian hypothesis. Whorf's most famous fragment states that:

[24] *Ivi.*

We dissect nature along lines laid down by our native language. The categories and types that we isolate from the world of phenomena we do not find there because they stare every observer in the face; on the contrary, the world is presented in a kaleidoscope flux of impressions which has to be organised by our minds and this means largely by the linguistic systems of our minds. We cut nature up, organise it into concepts, and ascribe significance as we do, largely because we are parties to an agreement to organise it in this way, an agreement that holds throughout our speech community and is codified in the patterns of our language. The agreement is of course, an implicit and unstated one, but its terms are absolutely obligatory; we cannot talk at all except by subscribing to the organisation and classification of data that the agreement decrees. We are thus introduced to a new principle of Relativity, which holds that all observers are not led by the same physical evidence to the same picture of the universe, unless their linguistic backgrounds are similar, or can in some way be calibrated[25].

Initially, the concept of Linguistic Relativity was widely accepted as a fundamental truth, with many psychologists and sociologists studying it as if it were unquestionable. However, the 1970s saw a growing interest in psychological universalism, which began to cast doubt on the theory's absolute validity. This period marked the decline of the theory's more extreme form, linguistic determinism, which suggests that our entire capacity for thought is limited by our language. Identifying the originator of linguistic determinism is challenging, as it doesn't directly stem from Whorf's writings, and no one has explicitly claimed to have developed this iteration of Linguistic Relativity. The idea that language completely governs our cognitive processes seems unlikely, leading to its eventual dismissal. Nonetheless, the 1990s witnessed a resurgence of interest in Linguistic Relativity, evidenced by an increase in empirical research and significant publications on the subject[26]. Currently, more nuanced versions of the hypothesis continue to undergo examination, leading to theoretical progress in the field. Contemporary research explores various domains to pinpoint where the impacts of Linguistic Relativity might manifest, highlighting the significance of identifying which elements of language influence specific cognitive processes. Most of the existing studies focus on whether language can impact perception, conceptualization, and categorization, which are not the same thing. Among the most common topics there

[25] B.L. Whorf, *Science and linguistics*, "Technology Review", 42, 6, 1940, pp. 229-231, (pp. 213-14).

[26] John J. Gumperz, Stephen C. Levinson, *Rethinking linguistic relativity*, Cambridge University Press, 1996; Susan Niemeier, René Dirven (eds.), *Evidence for linguistic relativity*, Benjamins, Amsterdam 2000; Martin Pütz, Marjolijn Verspoor (eds), *Explorations in linguistic relativity*, Benjamins, Amsterdam 2000.

are studies on colors[27], on the effects of grammatical gender[28], on object perception[29] and motion perception[30]. The studies on Linguistic Relativity are different in topics and methods, but they all identify some common aspects of language on thought:

1. The effects of language are on-line; namely, they are active as long as the language is being used. It means that these effects disappear when participants of an experiment are given a verbal interference task[31].
2. Some effects are active as long as verbalization is required; for example, during an experiment, some effects may be available only if the participant knows that she will have to give a verbal answer[32].
3. The effects of language on thought are not rigid. Language does not permanently and deeply affect cognition, as Linguistic Determinism claims. The effects of language create habits rather than rigid schemes[33].
4. Bilingual speakers can switch from habitual schemes when they change the language[34].

Whorf's examples, along with many other studies, typically focus on the second scenario. However, the case study discussed in this article pertains to both the first and third scenarios. This distinction arises because the subjects of the studies under review are predominantly prelinguistic infants. The experiments conducted, or at least a portion of them, contrast the impact of labels on categorization against categorization conducted in silence. Additionally, these studies investigate whether the introduction of varied labels influences the formation of categories.

[27] Franklin, A., et al. *Categorical perception of color is lateralized to the right hemisphere in infants, but to the left hemisphere in adults*, "Proceedings of the National Academy of Sciences of the United States of America", 105, 9, 2008, p. 3221. Regier, T., Kay, P., & Khetarpal, *Color naming reflects optimal partitions of color space*, "Proceedings of the National Academy of Sciences of the United States of America", 104, 4, 2007, pp. 1436-1441. Jonathan Winawer, Nathan Witthoft, Michael C. Frank *et al.*, *Russian blues reveal effects of language on color discrimination*, "Proceedings of the national academy of sciences", 104, 19, 2007, pp. 7780-7785.

[28] Roberto Cubelli, Daniela Paolieri, Lorella Lotto, Reno Job, *The effect of grammatical gender on object categorization*, "Journal of Experimental Psychology: Learning, Memory, and Cognition", 37, 2, 2011, pp. 449-460.

[29] Barbara C. Malt, Steven A. Sloman, Silvia Gennari, *et al.*, *Knowing versus naming: Similarity and the linguistic categorization of artifacts*, "Journal of Memory and Language", 40, 2, 1999, pp. 230-262.

[30] Athanasopoulos, P., et al. (2015). *Two languages, two minds: Flexible cognitive processing driven by language of operation*, "Psychological Science", 26, 4, 2015, pp. 518-526.

[31] J. Winawer *et al.*, *Russian blues*, cit.

[32] Dan Isaac Slobin, *Verbalized events*, *Evidence for linguistic relativity*, 198, 2000, pp. 107-138.

[33] Helen De Cruz, *Is linguistic determinism an empirically testable hypothesis?*, "Logique et Analyse", 52, 208, 2009, pp. 327-341.

[34] Stavroula T. Kousta, David P. Vinson, Gabriella Vigliocco, *Investigating linguistic relativity through bilingualism: the case of grammatical gender*, "Journal of Experimental Psychology: Learning, Memory, and Cognition", 34, 4, 2008, pp. 843-858.

The discussion surrounding Linguistic Relativity intersects with another significant debate on the Cognitive Penetrability of Perception (CPP), which posits that our perceptual experiences can be altered by beliefs, desires, or mental states. This notion is widely contested and scrutinized from both theoretical and empirical perspectives across various levels. Theoretically, CPP presents significant implications for epistemology, suggesting that if higher cognitive functions influence perception, then its reliability as a "truth-preserving source of knowledge of the world" comes into question[35]. Proponents of cognitive impenetrability, such as Carruthers[36], Fodor[37], and Sperber and Wilson[38], argue for the modular nature of perception, asserting that its processes are isolated, thus ensuring its dependability as a source of knowledge. In contrast, those advocating for cognitive penetrability challenge the strict modular view of the mind and argue for a perception-based foundation of knowledge that does not necessarily guarantee the preservation of truth. This debate has led to more nuanced discussions regarding the nature of perception and cognition and the demarcation between them, with some recent research even questioning the existence of such a boundary[39]. A focal point of this debate is whether early vision is susceptible to influence by higher cognitive processes, though the broader inquiry extends to the entirety of perception, with a particular emphasis on vision.

In the context of this article, it is important to consider the potential intersection between Linguistic Relativity and the Cognitive Penetrability of Perception (CPP). Linguistic Relativity posits that language influences cognitive functions, while CPP suggests that perception can be shaped by higher cognitive processes. This intersection may provide a framework for understanding the impact of linguistic labels on categorization. The experiments described herein may lie at this intersection, proposing that naming - a linguistic factor - might influence perceptual categorization. Although current literature is insufficient to fully confirm this hypothesis, it represents a promising area where linguistic labelling could affect perception on a cognitive level.

[35] Petra Vetter, Albert Newen, *Varieties of cognitive penetration in visual perception*, "Consciousness and cognition", 27, 2014, pp. 62-75.

[36] Peter Carruthers, *The architecture of the mind*, Oxford University Press, 2006.

[37] Jerry Alan Fodor, *The modularity of mind: an essay on faculty psychology*, MIT Press, 1983.

[38] Dan Sperber, Deidre Wilson, *Pragmatics, modularity, and mind-reading*, "Mind and Language", 17, 1-2, pp. 3-23.

[39] Jacob Beck, *Marking the Perception–Cognition Boundary: The Criterion of Stimulus-Dependence*, "Australasian Journal of Philosophy", 96, 2, 2018, pp. 319-334; D.C. Burnston, *Cognitive penetration and the cognition–perception interface*, "Synthese", 194, 9, 2017, pp. 3645-3666; Carlos Montemayor, Harry H. Haladjian, *Perception and cognition are largely independent, but still affect each other in systematic ways: Arguments from evolution and the consciousness-attention dissociation*, "Frontiers in Psychology", 8, 2017, e229991.

7. *Label Feedback Hypothesis and concluding remarks*

Throughout the past several decades, extensive research has sought to synthesize both the empirical outcomes and theoretical interpretations concerning how labels influence perception, as highlighted by contributions from Ferguson & Waxman[40], Plunkett *et al.*, Robinson *et al.*[41], and Waxman and Gelman[42]. At the heart of these discussions is the debate over whether the influence exerted by labels operates through a top-down or bottom-up mechanism. Plunkett articulates this distinction by describing the processes as supervisory versus non-supervisory, whereas Waxman and Gelman[43] frame the discussion using the metaphors "child-as-data-analyst" and "child-as-theorist". Despite originating from different theoretical backgrounds, these approaches ultimately address the same critical question: Is the effect of labels driven by higher cognitive functions, or does it fundamentally arise from elementary perceptual processes? Given their linguistic nature, labels are commonly believed to shape cognitive processes, reflecting the broad impact of language on cognition. However, it is also plausible that labels serve as auditory stimuli, facilitating perceptual categorization. This dual role implies that the influence of labels may represent a form of Cognitive Penetration, as well as the integration of labels with visual stimuli into a unified perceptual entity.

Within the array of top-down theories elucidating the role of labels in categorization, the Label Feedback Hypothesis stands out for comprehensive examination. Initially introduced by psychologist Gary Lupyan to delineate language's impact on adult cognition, this hypothesis also offers valuable insights into understanding the influence of labels on children. As Lupyan clarifies, his development of this theory was not limited to the effects of labelling alone, despite its pivotal contribution to the discussion, but emerged from the wider discourse surrounding Linguistic Relativity[44]. As mentioned in the previous paragraph, a review of the studies about language and thought shows that most of them have something in common: the effects of language can be easily nullified, for instance, with a verbal interference task.

Winawer *et al.* demonstrated that Russian speakers differentiate certain shades of blue more quickly than English speakers, attributing this to the Russian language having distinct terms for light blue ("goluboy") and dark

[40] B. Ferguson, S.R. Waxman, *Linking language*, cit.

[41] Christopher W. Robinson, Catherine A. Best, Wei (Sophia) Deng *et al.*, *The role of words in cognitive tasks: what, when, and how?*, "Frontiers in Psychology", 3, A95, 2012, pp. 1-8.

[42] S.R. Waxman, S. Gelman, *Early word-learning entails reference, not merely associations*, "Trends in cognitive sciences", 13, 6, 2009, pp. 258-263.

[43] Ivi.

[44] Gary Lupyan, *Linguistically modulated perception and cognition: The label-feedback hypothesis*, "Frontiers in psychology", 3, A54, 2012, pp. 1-13.

blue ("siniy"), unlike English, which uses "blue" for both shades[45]. This linguistic distinction allows Russian speakers to more rapidly distinguish shades of blue when they span across the "goluboy" and "siniy" categories. However, this advantage aligns with English speakers' performance when the shades compared fall entirely within either category. This linguistic benefit vanishes when Russian speakers engage in tasks requiring them to discriminate colors while simultaneously performing a verbal-interference task, such as silently rehearsing digit strings. This phenomenon, indicative of a transient effect, mirrors findings across various studies exploring the interplay between language and cognition. These outcomes suggest that language shapes the perceptual representation of colors, making colors within the same linguistic category seem more similar to each other. Thus, it appears language can alter perceptual space in a way that reflects Whorfian principles.

The ability of language to influence perception in real-time has led to diverse interpretations. Some psychologists argue that the temporary nature of language's effects suggests it does not fundamentally alter thought processes[46]. This viewpoint hinges on the separation of language and concepts, as well as the distinction between verbal and non-verbal processing. From this dichotomous perspective, the transient impact of language challenges the notion of how it could shape conceptual understanding if the effects are not enduring. This raises questions about the extent to which language and cognition are intertwined if concepts must be irrevocably altered by linguistic influence for the relationship to hold. Lupyan's Label Feedback Hypothesis (LFH) aims to resolve this apparent paradox by proposing that language influences perception by "manipulating ongoing perceptual processing online"[47]. This modulation is swift, automatic, and operates within a distributed interactive system. Within the framework of LFH, the act of labelling plays a crucial role in elucidating how language impacts thought, as labels selectively enhance the perceptual features indicative of the labelled category. Lupyan advocates for the view that categorization is a process where "different (i.e., non-identical) stimuli come to be represented as identical in some respect"[48], thereby positioning himself as a proponent of the cognitive penetrability of perception. In exploring how labels influence categorization, scholars divide into two primary theoretical camps: one positing that labels modify percep-

45 J. Winawer, *Russian blues*, cit.

46 Dessalegn, Barbara Landau, *More than meets the eye: The role of language in binding and maintaining feature conjunctions*, "Psychological Science", 19 (2), 2008, pp. 189-195; Lila Gleitman, Anna Papafragou, *Language and thought*, in Keith J. Holyoak, Robert G. Morrison (eds.), *Cambridge handbook of thinking and reasoning*, Cambridge University Press, 2005, pp. 633-661.

47 G. Lupyan, *Cognitive Penetrability of Perception in the Age of Prediction: Predictive Systems are Penetrable Systems*, "Review of Philosophy and Psychology", 6, 4, pp. 547-569.

48 G. Lupyan, *Linguistically modulated perception*, cit., p. 4.

tion directly, and another suggesting that labels impact categorization as a higher-level cognitive process, distinct from perceptual processes. Within the faction that views labelling as a form of perceptual modification—or cognitive penetration - opinions diverge on whether this influence affects early or late stages of visual processing, as discussed comprehensively by Raftopoulos[49]. Lupyan aligns with the perspective that perception is susceptible to influence at all stages, advocating for a more radical viewpoint that blurs the distinction between perception and cognition entirely. Echoing Goldstone and Hendrickson[50], Lupyan asserts that the body of empirical data sufficiently demonstrates that perception undergoes alteration: learning to categorize distorts perception and changes certain areas within the perceptual space. According to this view, categorization of objects transcends mere decision-making; it constitutes a fundamental perceptual process. The act of naming, in essence, is an act of categorization, and the process of learning to link labels with objects is considered a form of category training[51]. According to Lupyan:

> The label-feedback hypothesis proposes that language produces transient modulation of ongoing perceptual (and higher-level) processing. In the case of colour, this means that after learning that certain colours are called "green", the perceptual representations activated by a green-coloured object become warped by top-down feedback as the verbal label "green" is co-activated. This results in a temporary warping of the perceptual space with greens pushed closer together and/or greens being dragged further from non-greens. Viewing a green object becomes a hybrid visuo-linguistic experience. Knowing that some colours are called green means that our everyday experiences of seeing become affected by the verbal term, which in turn makes the visual representation more categorical. This modulation can be increased – upregulated – by activating the label to a greater than normal degree as when a participant hears a verbal label prior to seeing a visual display. Conversely, verbal interference is one way to down-regulate the activation of labels leading to reduced influences effect of language on "non-verbal" processing[52].

This position makes it possible to acknowledge the reversibility of the effects of language and it is committed to a double nature of representation as visual and linguistic at the same time.

The Label Feedback Hypothesis (LFH) challenges the traditional model of conceptual representations that distinguishes between semantic and visual representations, advocating for a view where language-activated representa-

[49] Athanassios Raftopoulos, *Cognitive penetrability and the epistemic role of perception*, Palgrave Macmillan, London 2019.

[50] Robert Goldstone, Andrew Hendrickson, *Categorical perception*, "Wiley Interdisciplinary Reviews: Cognitive Science", 1, 2009, pp. 69-78.

[51] R. Goldstone, Y. Lippa, R.M. Shiffrin, *Altering object representations through category learning*, "Cognition", 78, 1, 2001, pp. 27-43.

[52] G. Lupyan, *Linguistically modulated perception*, cit., p. 4.

tions are multimodal. According to this approach, concepts are represented not through a single modality but through the activation of all relevant modalities; for instance, the visual components of concepts are represented by some of the same neural mechanisms that process their visual perception[53]. Lupyan and Thompson-Schill provide empirical support for this model of hybrid representation. In their research, verbal cues, such as the word "cat", were shown to facilitate a picture verification task more effectively than non-verbal cues like the sound of a cat meowing or a related verbal cue that did not directly denote the object, such as the word "meowing". This efficiency of conceptual activation by language suggests that conceptual representations are more readily activated by linguistic cues. Their results challenge the notion that labels merely facilitate access to non-verbal concepts, as the same conceptual content would presumably be accessible through other cues if this were the case. Instead, language appears to foster distinct types of conceptualizations that are utilized in item categorization[54].

In Lupyan *et al.*, a study similar to those discussed in this article but conducted with adults, two experiments were designed to explore how labels influence the formation of new categories[55]. In the first experiment, participants were asked to discriminate between two types of aliens on a newly discovered planet - those to approach and those to avoid - based on one-by-one presentations. Decisions were met with immediate feedback: a buzz for incorrect categorizations and a bell for correct ones. Participants were divided into two groups, Label and No-Label; in the Label group, after receiving feedback, a printed label (either "leebish" or "grecious") appeared beside the alien. The test phase involved categorizing an alien as either approachable or avoidable, including aliens not presented during the training phase. The second experiment mirrored the first, with the distinction that labels were presented auditorily. An additional Location condition was introduced to rule out the facilitative effect of non-linguistic feature associations. The findings indicated faster categorization with label presence; non-verbal feature association did not yield similar improvements. Moreover, categories formed with verbal cues proved more durable, maintaining their advantage even when labels were absent and in subsequent experiments. These results lend support to the notion that labels enhance categorization performance, highlighting

[53] Lawrence W. Barsalou, *Grounded cognition*, "Annual Review of Psychology", 59, 1, 2008, pp. 617-645; Friedemann Pulvermüller, *Neurobiological mechanisms for semantic feature extraction and conceptual flexibility*, "Topics in Cognitive Science", 10, 3, 2018, pp. 590-620.

[54] G. Lupyan, Sharon L. Thompson-Schill, *The evocative power of words: Activation of concepts by verbal and nonverbal means*, "Journal of Experimental Psychology: General", 141, 1, 2012, pp. 170-186.

[55] G. Lupyan, David H. Rakison, James L. McClelland, *Language is not just for talking: redundant labels facilitate learning of novel categories*, "Psychological Science", 18, 12, 2007, pp. 1077-1083.

the enduring positive impact of labels, a contrast to Plunkett *et al.*

Linking these findings to the Label Feedback Hypothesis (LFH) suggests the necessity of auxiliary hypotheses, such as the idea that categorization processes in young infants and adults share common principles. However, current research suggests differences in how infants and adults categorize and name categories, raising questions about the comparability of these processes across age groups[56]. Further investigation is required to determine the significance of these differences. Additionally, examining whether infants actually learn labels during such experiments and, if not, whether a feedback mechanism operates at the neural level in the absence of a learned label is crucial for understanding the breadth of label effects on categorization.

[56] Eef Ameel, Barbara Malt, Gert Storms, *Object naming and later lexical development: From baby bottle to beer bottle*, "Journal of Memory and Language", 58, 2, 2008, pp. 262-285.

Extending cognitive development into the body and the environment

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Abstract: Development is a fundamentally embodied and enacted process, and human development cannot be understood outside of the embodied and extended context in which it takes place. A number of perspectives on the study of philosophy, perception, action and cognition in general have argued that cognition extends into the body and the environment. This paper provides a brief introduction on these perspectives, focusing on Gibson's *Ecological Perception* and Varela, Thompson and Rosch's *Enactivism*, as well as Clark's *Predictive Coding* framework. Despite their differences, all three approaches share a focus on explaining cognition beyond the limits of the brain. Studying cognition as part of a general system that includes body and environment has important implications for the explanations generated by developmental psychology. The paper reviews and contextualizes research that engages with these implications, and provides suggestions for further research in the hope of stimulating systematic research into how body and environment shape cognition during development.

Keywords: Ontogeny, Embodiment, Enactivism, Ecological Psychology, Predictive coding.

1. *Introduction*

The last decades have seen the emergence of theoretical work in the areas of Ecological Psychology,[1] Predictive Processing[2] and Enactivism[3] that has taken a radical reinterpretation of the relationships between an organism's cognitive system, its body and the external world. Rather than focusing on

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1 James J. Gibson, *The Ecological Approach to Visual Perception*, Psychology Press, 1986.

2 Andy Clark, *Whatever Next? Predictive Brains, Situated Agents, and the Future of Cognitive Science*, "Behavioral and Brain Sciences", 36, 2013, pp. 181-204.

3 Francisco J. Varela, Eva Thompson and Eleanor Rosch, *The Embodied Mind: Cognitive Science and Human Experience*, MIT Press, 1992.

abstract cognitive abilities that can be discussed with minimal reference to external processes, work in these fields has made the case that internal cognition cannot be separated from external processes involving the body-in-the-world. Whilst these questions are relevant for psychology as a whole, they are particularly relevant for the field of developmental psychology: during the early years of life, children's cognitive development is shaped by their physical development. Children's changing body and motor abilities constrain and scaffold their cognitive abilities and have a profound impact on the structure of information provided by the environment. Although there has been a sizeable body of recent research that has found unique and novel ways of linking cognitive and motor development, this has often happened without explicit reference to these theoretical models of cognition. At the same time, theoretical work that explicitly discusses the links between cognition, body and environment has commonly neglected early cognitive development as a source of the emergence of behavior. However, the changing environment provided by children's emerging motor abilities potentially provides interesting case studies of the externalization of cognition.

In the current paper, I argue that developmental psychology can benefit from the perspectives provided by these approaches, but that theories extending cognition can also benefit from a deeper understanding of developmental processes. I will discuss examples from developmental research from the first years of life that has taken into account how motor, body and cognitive development are linked, as well as potential avenues for further research.

2. *Cognitive development extended and enacted*

Developmental processes are strongly intertwined with the environment and cannot be understood without each other. This perspective is shared by a number of theoretical perspectives that emphasize the constitutive role of the body and the external world in cognition. In the current paper I focus on the perspectives provided by James Gibson's Ecological perception[4] and Enactivism, as proposed by Varela, Thompson and Rosch[5] and the Predictive Coding framework, by Andy Clark[6]. All three accounts share three main themes: (1) an emphasis on the role of the body in shaping behavior, perception and learning, (2) a tight integration of the environment and the agent, and (3) the individual as an active agent as part of the sense-making process. Although the resulting descriptions of development are more complex, tak-

4 J.J. Gibson, *The Ecological Approach*, cit.
5 F. Varela *et al.*, *The Embodied Mind*, cit.
6 A. Clark, *Whatever Next?*, cit.

ing into account the interactive and embodied nature of development addresses some problems inherent in accounts of development that focus on cognitive development on its own, or work along traditional lines of the nature-nurture debate.

3. *Ecological psychology*

James Gibson argued that perception cannot be understood without explicit reference to the individual within their environment and the actions that are afforded to the individual within their specific actions, because the purpose of perception is to engage with the world, properties of the world are perceived directly in terms of the actions they afford, rather than abstracted internal representations. James Gibson also recognized the importance of identifying invariants of information in the environment, and which of their features remain stable or change systematically as the agent moves in space. For example, the information provided for depth perception in a static picture is very limited compared to the information available to an agent embedded in the environment that is able to move around. The perspective of the agent, which provides a point of reference in the world, provides information on the relationship of the agent to their environment. Taking into account the full complexity of the information available actually reduces the inferences the cognitive system is required to make. Eleanor Gibson similarly applied Ecological Psychology to developmental questions; further criticizing the distinction between perception, knowledge and action[7] and tracing cognitive development along motor development[8]. Ecological psychology emphasizes the learner as an active agent in learning: "We don't see, we look"[9].

4. *Enactivism*

According to the enactivist literature, cognition is a process that emerges from agents engaging and acting in an environment[10]. Building on the con-

[7] Eleanor J. Gibson, *Exploratory Behavior in the Development of Perceiving, Acting, and the Acquiring of Knowledge*, "Annual Review of Psychology", 39, 1 1988, pp. 1-42. James J. Gibson, Eleanor J. Gibson, *Perceptual Learning: Differentiation or Enrichment?*, "Psychological Review", 62, 1, 1955, pp. 2-41.

[8] E.J. Gibson, *Exploratory Behavior*, cit.

[9] *ivi*, p. 5.

[10] F.F. Varela *et al., The Embodied Mind,* cit.

cept autopoesis, it describes agents as autonomous beings that aim to sustain themselves in their environment. Agents make sense and bring about meaning by engaging with the environment, and their opportunities to engage with the environment is determined by their embodied interactions with it. Strong versions of enactivsm[11] claim that because of the extent of the conceptual continuity between cognition, body and environment, the notion of that cognitive processes require internal mental representations is not meaningful, and cognition, in general, can be explained without them. Cognition is tightly coupled to the environment; there is nothing to be represented[12].

5. *Clark's Extended Mind and Predictive Processing*

The extended mind hypothesis proposes that at least some cognitive processes extend into the environment and rely on external processes using the body and the environment[13]. For example, by placing the bin bag in front of the door, I will remember to take out the trash when I stumble out of the house in the morning. Although the underlying process of remembering is different, this approach fulfills the same *function* as using the memory in the brain. In nature, a lot of cognitive processes rely on embodied mechanisms and allow agents to solve complex problems that would otherwise require considerable cognitive resources[14]. Furthermore, by extending cognition beyond the brain, Clark and Chalmers argue that they:

> […] allow a more natural explanation of all sorts of actions. One can explain my choice of words in Scrabble, for example, as the outcome of an extended cognitive process involving the rearrangement of tiles on my tray. Of course, one could always try to explain my action in terms of internal processes and a long series of 'inputs' and 'actions', but this explanation would be needlessly complex[15].

A related perspective is shared by the predictive processing framework. Clark argues that according to the predictive processing framework, living beings attempt to predict their environment. The brain is the center point of the "prediction engine", predicting the incoming information streams on different hierarchical levels, where higher levels are attempting to predict lower levels. Rather than feeding sensory signals forward, only the error

11 D. Hutto, D. Abrahamson, *Embodied, Enactive Education*, cit.

12 Julian Kiverstein, *Extended Cognition*, in Albert Newen, Leon De Bruin, and Shaun Gallagher (eds.), *The Oxford Handbook of 4E Cognition*, Oxford University Press, 2018, pp. 19-40,

13 Andy Clark, David Chalmers, *The Extended Mind*, "Analysis", 58, 1, 1998, pp. 7-19.

14 Andy Clark, *Being There: Putting Brain, Body, and World Together Again*, The MIT Press, Cambridge 1997.

15 A. Clark, D. Chalmers, *The Extended Mind* cit., pp. 9-10.

signal (i.e. the difference between the incoming and the predicted signal) is passed on to higher levels. As in the other two accounts, cognition can draw upon action and perception equally, and can extend into the world to include external features, such as tools. The predictive coding framework is more lenient towards mental representations and does not object to their existence in principal. For example, mental representations emerge out of engaging and interacting with the environment in ways that produce models of the external world that are partially decoupled from the world around them[16].

5.1 *Common themes of Ecological Psychology, Enactivism, and Predictive Processing*

There are a number of shared themes between all three approaches. These include the embodied nature of experience, the relevance of an agent's agency in exploring their environment and a tight integration of cognition, action and environment. The cognitive system, as described by Clark, Gibson and Varela *et al.* includes the body and the external world, either just functionally (Clark), or playing a constitutive role in cognition (Gibson, Varela *et al.*). These differences are subtle theoretical arguments, and potentially difficult to resolve empirically[17]. However, despite these disagreements, there is agreement that cognition extends beyond the brain in ways beyond traditionally considered by cognitive psychology. Furthermore, the tight link between environment and agent reduces (Clark) or does not require cognitive representations (Gibson, Varela *et al.*). Historically, the arguments that the child is an active participant in its learning and the role of environmental scaffolding can be found in the works by Jean Piaget[18] and Lev S. Vygotsky[19]. Indeed, all three extended perspectives[20] reference their works.

6. *What does it mean to be an agent in a body?*

A central theme of enactivist perspectives is that cognition takes place within a body that determines the way we can interface with the world and what opportunities for learning we will receive. The developing body con-

16 A. Clark, *Predicting Peace*, "Open MIND", 2015, pp. 1-7.

17 J. Kiverstein, *Extended Cognition*, cit.

18 Jean Piaget, *The Construction of Reality in the Child*, Routledge, London 1954.

19 Lev S. Vygotsky, *Mind in Society: Development of Higher Psychological Processes*, Harvard University Press, Cambridge 1978.

20 A. Clark, *Being There*; Varela *et al.*, *The Embodied Mind* cit.; E.J. Gibson, *Exploratory Behavior*, cit.

strains and shapes the perceptual information and provides a rich and highly structured environment[21]. Whilst these effects have been shown on small scales, future theoretical work needs to describe how these developmental trajectories contribute to species-specific behavioral phenotypes. For example, compared to their closest evolutionary relative, human infants spend almost twice the amount of time *not* being able to walk. According to the post-natal dependency hypothesis[22], infants' delayed motor abilities lead to a radically different developmental trajectory during which social signals are meaningful indicators of potential opportunities for action with others and with the environment. Accordingly, it is human infants' comparatively long period of dependency that provides the foundation of social learning in humans.

Understanding the developmental trajectories from an ecological-enactivist perspective also allows us to develop a stronger understanding about the development of cognitive skills and their underlying foundations. Often, debates have focused on innate compared to learned skills and behaviors. Extending development beyond the cognitive skills and understanding the contributions of body and environment as *constitutive*, shifts our understanding of what it means to acquire species-specific behaviors. Focusing on the role of specific genes and innate modules merely serves as a placeholder for developmental processes and fails to adequately describe development, both ontogenetically and evolutionary[23]. The process of development is fundamentally emergent, accounting for higher order explanations of behavior based on lower order of information, but this requires describing the processes that mediate between these different levels. Bodily development plays an important mediating and constituting role in structuring information during development.

Because of this, enactivist, extended and ecological approaches to cognitive development are by default skeptical of poverty of stimulus arguments. The information landscape available to children is rich and taking the multifaceted input into account, provides structures that simplify, rather than complicate the information that needs to be processed. Because the egocentric perspective provides *relevant* information readily accessible to the agent, it simplifies the information the agent needs to process. Similar mechanisms that structure spatial perception from the perspective of an active agent, as described by Gibson, are also at play in the descriptions of the information available to infants when learning words: here, the baby's view is better[24]. More information does not lead to more complex information processing, but is nat-

21 Elizabeth Ray, Cecilia M. Heyes, *Imitation in Infancy: The Wealth of the Stimulus*, "Developmental Science", 14, 1, 2011, pp. 92-105; L.B. Smith *et al., The Developing Infant*, cit.

22 C. Kliesch, *Post-Natal Dependency*, cit.

23 Susan Oyama, *The Ontogeny of Information*, Duke University Press, 2000.

24 D. Yurovsky, L.B. Smith, C. Yu, *Statistical Word Learning*, cit.

urally meaningful. A sceptic might ask whether these strong notions of embodiment and extendedness are actually necessary, or whether they represent a shift from innate to learned explanations of development. But these distinctions hide the complex interactions between innate and learned behaviors, as argued by developmental systems biology[25]. Developmental explanations of behavior need to take into account body development and the environmental context where it takes place. Learned cognitive abilities can still be genetically determined by physiological phenotypes, and cognitive skills learned later in life can still systematically affect physiological phenotypes.

One might worry that tracing these relationships leads to an unnecessarily complex description; as Patrick Bateson self-mockingly writes: "Never use a simple explanation if a more complicated one will do instead"[26]. Eschewing complexity for complexity's sake can lead to vacuous theorizing that everything, everywhere all at once is relevant for an agent, defying scientific falsifiability[27]. Enacted, ecological and extended arguments are strongest when they can make concrete predictions about how an agent should respond given a specific context and opportunities for action. Often, we will find that the resulting picture is not actually more complex, but that traditional representational perspectives rely on implicit assumptions that are not necessary when taking into account the perspective of an organism in its environment. This is evident in Gibson's description of visual perception where understanding the visual perspective of an animal provides ample information and does not require the reconstruction of the environment. We also find it in enactivist accounts of social cognition that question that others' mental states are not accessible to an observer and need to be inferred. Rather, the social context provides rich information on social interactions allowing the interaction and interpretation of behavior even without access to their mental states[28].

7. *Learning environments shape information before and after birth*

Human development is characterised by a unique developmental trajectory, providing what Linda Smith *et al.*[29] coined "a curriculum for statistical

[25] S. Oyama, *The Ontogeny of Information*, cit.

[26] Patrick Bateson, *The Nest's Tale. A Reply to Richard Dawkins,* "Biology & Philosophy", 21, 4, 2006, p. 557.

[27] Karl R. Popper, *Conjectures and Refutations*, Routledge, London 2002.

[28] Jeremy Carpendale, Charlie Lewis, *What Makes Us Human: How Minds Develop Through Social Interactions*, Routledge, New York 2020; Shaun Gallagher, *Action and Interaction*, Oxford University Press, New York 2020.

[29] Kenneth J. Gerhardt, Robert M. Abrams, *Fetal hearing: Characterization of the stimulus and response*, in "Seminars in Perinatology", 20, 1, pp. 11-20. Linda B. Smith, Swapnaa Jayaraman, Eliza-

learning". This curriculum is shaped by the environment and the changes provided by infants' emerging motor abilities that affect opportunities for action and interaction. This developmental process starts even before birth, but our current understanding of the contribution of the fetal environment of later cognitive capacities is only emerging. Concepts, such as the understanding of self, do not just suddenly come online when the child reaches a certain milestone or age; rather they emerge out of interaction with the environment and the opportunities it provides. However, early in development, and particularly so in utero, the self of the child is better described as nested within their mother's self[30], and this interdependence continues after birth[31]. The fetal environment differs in many important aspects from the one after birth. The womb provides an environment with specific features; whilst light can travel through, it is diffused by the tissue surrounding the fetus[32]. Likewise, sound can be heard, but higher frequencies are attenuated[33]. Human fetuses spend a long time in the womb, close to their mother's source of vocalizations and already learn features of human speech and can use these features to identify the faces of their mothers based on their speech[34] and recognize stories previously heard in the womb after birth[35].

The transition from pre to post-natal environment might facilitate learning beyond direct association between pre- and post-natal information through curiosity-driven learning. According to this literature, information is learned most effectively when it is sufficiently novel to be interesting, but familiar enough to be integrated into existing knowledge. This balance between old and new has been referred to as the "Goldilocks effect"[36]. For example, in-

beth Clerkin, and Chen Yu, *The Developing Infant Creates a Curriculum for Statistical Learning*, "Trends in Cognitive Sciences", 1767, 22, 2018, p. 4.

[30] Anna Ciaunica, Axel Constant, Hubert Preissl and Katerina Fotopoulou, *The first prior: From co-embodiment to co-homeostasis in early life*, "Consciousness and Cognition", 91, 2021, pp. 103-117.

[31] Aikaterini Fotopoulou, Manos Tsakiris, *Mentalizing Homeostasis: The Social Origins of Interoceptive Inference*, "Neuropsychoanalysis", 19, 1, 2017, pp. 3-28.

[32] Marco Del Giudice, *Alone in the Dark? Modeling the Conditions for Visual Experience in Human Fetuses*, "Developmental Psychobiology", 53, 2, 2010, pp. 214-19.

[33] M.A. Vince, A.E. Billing, B.A. Baldwin *et al., Maternal Vocalisations and Other Sounds in the Fetal Lamb's Sound Environment*, "Early Human Development", 11, 2, 1985, pp. 179-90; Melanie J. Spence and Anthony J. DeCasper, *Prenatal Experience with Low-Frequency Maternal-Voice Sounds Influence Neonatal Perception of Maternal Voice Samples*, "Infant Behavior and Development", 10, 2, 1987, pp. 133-42.

[34] Fatma Z. Sai, *The Role of the Mother's Voice in Developing Mother's Face Preference: Evidence for Intermodal Perception at Birth*, Infant and Child Development", 14, 1, 2005, pp. 29-50.

[35] Anthony J. De Casper, Melanie J. Spence, *Prenatal Maternal Speech Influences Newborns' Perception of Speech Sounds*, "Infant Behavior and Development", 9, 2, 1986, pp. 133-50.

[36] Jacqueline Gottlieb *et al.*, *Information-Seeking, Curiosity, and Attention: Computational and Neural Mechanisms*, "Trends in Cognitive Sciences", 17, 11, 2013, pp. 585-93.

fants' pre-natal experience of attenuated sounds might facilitate their interest in similar sounds that include higher pitch but are otherwise similar to the ones previously experienced in the womb, and might contribute to infants' preference for infant-directed speech[37]. Likewise, the visual experience in the womb is characterized by low contrast, which might lead to a preference for specific combinations of high-contrast stimuli, potentially explaining neonates' preference for eye-like contrast polarity[38].

8. *The importance of the peripersonal space and its social extension*

For agents in the environment, being able to exert change in the environment is crucial, and this ability is determined by the body and context. Studies with adult humans have shown that proficiency to act in the environment fundamentally affects perception[39], and objects within the proximity of our influence are processed differently. For example, right-handers perceive objects within reaching distance as further away if they are presented on the left, compared to the right side of the body[40]. As I argued elsewhere[41], infants perceive others as providing affordances otherwise not available in the environment. Others' helping hand might literally extend the affordance space provided to infants.

Taking the perspective that acting with the help of objects and others is similar to acting on the environment on our own forces us to rethink how infants will learn about their environment. This perspective represents an extension of Andy Clark's description of the parity principle[42], according to which structures in the environment can supplement or even replace cognitive processes in ways that are functionally the same. Similar arguments have also been made by Gibson[43] and Merleau-Ponty[44], who argue that proficient tool users integrate tools into their perceptual system. Hands, tools, words

37 Anne Fernald, Patricia Kuhl, *Acoustic Determinants of Infant Preference for Motherese Speech*, "Infant Behavior and Development", 10, 3, 1987, pp. 279-93,

38 Teresa Farroni, Gergely Csibra, Francesca Simion, and Mark H. Johnson, *Eye Contact Detection in Humans from Birth,* "Proceedings of the National Academy of Sciences", 99, 14, 2002, pp. 9602-9605.

39 Dennis R. Proffitt, Sally A. Linkenauger, *Perception Viewed as a Phenotypic Expression*, in Wolfgang Prinz, Miriam Beisert, and Arvid Herwig (eds.), *Action Science: Foundations of an Emerging Discipline*, 171, MIT Press Scholarship Online, 2013.

40 Sally A. Linkenauger *et al.*, *The Effects of Handedness and Reachability on Perceived Distance*, "Journal of Experimental Psychology: Human Perception and Performance", 35, 6, 2009, pp. 1649-1660.

41 C. Kliesch, *Post-Natal Dependency as the Foundation of Social Learning in Humans*, submitted.

42 A. Clark, D. Chalmers, *The Extended Mind*, cit.

43 J.J. Gibson, *The Ecological Approach*, cit.

44 Maurice Merleau-Ponty, *The Structure of Behaviour*, Beacon Press, Boston 1967.

and others afford interaction[45] and effect change in the environment.

Children explore the world using their mouths, eyes and hands. Once manual and oral exploration cease to provide much novel information (either because it has been done or is unachievable) and eye-hand coordination improves, proximal visual inspection becomes more interesting. Observing objects in the distance becomes more rewarding, particularly in the presence of caregivers. Caregivers provide novel information and can support curiosity-driven learning by providing information that is relevant to the child at that particular moment[46]. Before infants are able to walk at around 12 months, they spend a comparatively long time being dependent on caregivers. Human walking onset is much later than that of other species[47]. This dependency means that children's experience is modulated by others for a much longer time. Others are therefore a fundamental aspect of engaging with the environment, for example by providing the opportunities to engage with objects[48] or reach objects that would otherwise be too far away[49]. In referential interactions and communication with others, many languages distinguish between objects that are under the direct influence of the self or the respective partner, or that outwit the reach and therefore no longer can be exerted control[50]. Such control is not restricted to objects within the own space, but can also be exerted through others. This is apparent in 8-month-olds reaching for objects in the presence of others[51]. In adults, instructing a partner to carry out an action produces a readiness potential similar to carrying out the action oneself[52].

[45] Paul Watzlawick, Janet Beavin Bavelas, Don D Jackson, *Pragmatics of Human Communication*, W.W. Norton, New York 1967.

[46] Sumarga H. Suanda Meagan Barnhart, Linda B. Smith, and Chen Yu, "The Signal in the Noise: The Visual Ecology of Parents' Object Naming," *Infancy*, 24, 3, 2018, pp. 455-76.

[47] Patrizia Potì, Giovanna Spinozzi, *Early Sensorimotor Development in Chimpanzees (Pan Troglodytes)*, "Journal of Comparative Psychology", 108, 1, 1994, pp. 93-103.

[48] Kaya de Barbaro, Christine M. Johnson, Deborah Forster, Gedeon Deák, *Sensorimotor Decoupling Contributes to Triadic Attention: A Longitudinal Investigation of Mother-Infant-Object Interactions*, "Child Development", 87, 2, 2015, pp. 494-512.

[49] Verónica C. Ramenzoni and Ulf Liszkowski, *The Social Reach: 8-Month-Olds Reach for Unobtainable Objects in the Presence of Another Person*, "Psychological Science", 27, 9, 2016, pp. 1278-85.

[50] Kenny R. Coventry *et al., Language Within Your Reach: Near–Far Perceptual Space and Spatial Demonstratives*, "Cognition", 108, 3, 2008, pp. 889-95; Kenny R. Coventry *et al., Spatial Communication Systems Across Languages Reflect Universal Action Constraints*, "Nature Human Behaviour", 7, 2023, pp. 2099-2110.

[51] V.C. Ramenzoni and U. Liszkowski, *The Social Reach*, cit.

[52] Isabella Boux *et al. Brain Signatures Predict Communicative Function of Speech Production in Interaction*, "Cortex", 135, 2021, pp. 127-145.

9. *Freeing the hands*

Freeing the hands allows for objects that are manipulated to be visible, and allows for a close integration of vision-hand motor coordination. Having the hands free for interacting with the environment allows for the exploration of objects, and coordinates object handling and vision for further exploration. Being able to see the effects of one's actions allows for a better understanding of the potential actions necessary to achieve the desired outcomes. Human children can start to manipulate objects whilst being able to see the effects of their manipulation directly, providing a much-improved ability to investigate the causality of manual actions. Unlike young chimpanzees, they are not able to get up and start exploring other objects that are potentially more interesting yet, and therefore show different patterns of object exploration[53]. Shifts in body morphology are not coincidental, they are important aspects of shaping the affordance space in humans.

Changes in body morphology and action opportunities are difficult to investigate experimentally. However, the importance of embodied contributions to cognition becomes particularly evident in comparative work, such as corvids' ability to use tools to retrieve food. New Caledonian Crows are skilled tool users[54], however, their species-specific adaptations are not (just) cognitive. Cross-species comparisons amongst other birds suggest that tool use correlates with the bird's forward-facing eyes and the length of the beak. These features reduce task complexity by allowing visual guidance since the tip of the beak is visible during object manipulation[55]. It is likely that human morphology contributes in similar ways.

The link between body development and action also plays a role in children's ability to engage in pointing. Human index finger pointing is a universal gesture used across all known communities and cultures. Some have argued that finger pointing emerges from children attempting to grasp objects in the presence of caregivers[56]; whilst others suggest that pointing emerges from touch[57]. Being able to extend and grasp objects helps direct attention to them, and already by the age of 8 months, infants will reach for out-of-reach objects in the presence of caregivers and other potential helpers, but not when on their own[58].

For humans, pointing provides an important ability to interact with the

53 P. Potì, G. Spinozzi, *Early Sensorimotor* cit.

54 Christian Rutz *et al.*, *The Ecological Significance of Tool Use in New Caledonian Crows*, "Science", 329, 5998, 2010, pp. 1523-1526.

55 Jolyon Troscianko *et al., Extreme Binocular Vision and a Straight Bill Facilitate Tool Use in New Caledonian Crows*, "Nature Communications", 3, 1, 2012, A1110.

56 V.C. Ramenzoni, U. Liszkowski, *The Social Reach*, cit.

57 C. O'Madagain, G. Kachel, B. Strickland, *The Origin of Pointing*, cit.

58 V.C. Ramenzoni, U. Liszkowski, *The Social Reach*, cit.

environment and emerges around 12 months of age. Several embodied explanations have been put forward: according to the reaching hypothesis, infants learn to point through a stylized reach, through which they get caregivers to pass objects[59]. Cathal O'Madagain and colleagues[60] provide an alternative explanation by suggesting that, provided the way that 18-month-old children interpret and use pointing gestures, as an extended touch with the index finger, rather than an arrow in space. Using the index finger to touch objects indicates the location of the exploration and provides information on its texture and physicality, but does not bring the object under direct control. A further contributing factor to the prevalance of finger-pointing is young children's failure to understand object size and attempt to touch far-away objects. Children between 15-30 months try to climb into a mini version of a full-sized toy car, failing to appreciate the affordance of size[61]. Younger infants might also struggle to appreciate the correspondence between distance and size, and attempt to use a pincer grip (typically used for small objects) for bigger objects that are far away. Index-finger pointing might emerge because far objects are perceived as smaller, requiring a pincer touch, rather than a full hand grasp.

10. *Walking: A shift in perspective*

Human infants learn to walk at around 12 months of age[62]. Walking shifts the perspective of the agent and allows the transportation of objects, for example for sharing attention with caregivers[63]. A walking learner is more likely to encounter novel objects or use their freed hands to interact with them, providing an opportunity for carrying and sharing attention with caregivers[64] and expanding the vocabulary.[65] Walking allows for exploration and

[59] *Ivi*.

[60] Cathal O'Madagain, Gregor Kachel, Brent Strickland, *The Origin of Pointing: Evidence for the Touch Hypothesis*, "Science Advances", 5, 7, 2019, eaav2558.

[61] Judy S. De Loache, David H. Uttal, Karl S. Rosengren, *Scale Errors Offer Evidence for a Perception-Action Dissociation Early in Life*, "Science", 304, 5673, 2004, pp. 1027-29; Mikako Ishibashi, Yusuke Moriguchi, *Understanding Why Children Commit Scale Errors: Scale Error and Its Relation to Action Planning and Inhibitory Control, and the Concept of Size*, "Frontiers in Psychology", 8, 2017, A826.

[62] Karen E. Adolph, Justine E. Hoch, *Motor Development: Embodied, Embedded, Enculturated, and Enabling*, "Annual Review of Psychology", 70, 1, 2019, pp. 141-64.

[63] Lana B. Karasik, Catherine S. Tamis-LeMonda, and Karen E. Adolph, *Transition from Crawling to Walking and Infants' Actions with Objects and People*, "Child Development", 82, 4, 2011, pp. 1199-1209.

[64] Lana B. Karasik Karen E. Adolph, Catherine S. Tamis-LeMonda, and Alyssa L. Zuckerman, *Carry on: Spontaneous Object Carrying in 13-Month-Old Crawling and Walking Infants*, "Developmental Psychology", 48, 2, 2012, pp. 389-97.

[65] Ora Oudgenoeg-Paz, M. (Chiel), J. M. Volman, and Paul P. M. Leseman, *Attainment of*

discovering new affordances in the world, but is rewarding on its own.[66] In a room full of toys, children roam from toy to toy; in an empty room, they use a similar amount of steps just cycling around their caregivers[67].

The development of walking emerges primarily out of the physical ability and toddler's curiosity. Toddlers explore their emerging walking abilities despite facing many challenges that, for an adult, would be penalizing[68]. Frequent falls, like those experienced by newly walking infants, would potentially be painful or result in serious injury for adults. However, toddlers' falls are a lot less severe due to their smaller size and body fat distribution[69]. The emergence and control of many aspects of the walking movement is provided by the structure of the muscles and tendons, rather than direct cognitive control[70]. Infants' body weight initially constrains walking, and infants that are provided the ability to practice their walking (e.g. by walking on a treadmill) will show the appropriate stepping actions at 3-5 months, before being able to walk on their own[71]. Individual and cultural differences that impact toddler mobility, such as body weight, wearing diapers or long periods of cradling that affect body development[72] could have knock-on effects on the trajectories of children's cognitive development.

11. *How embodied is the "curriculum for learning"?*

Recent works in developmental psychology have made use of modern technologies that allow the collection of large amounts of data that can be analyzed using modern machine-learning technologies. This line of research takes the importance of the embodied, egocentric position of children as a

Sitting and Walking Predicts Development of Productive Vocabulary Between Ages 16 and 28 Months, "Infant Behavior and Development", 35, no. 4 (December 2012, pp. 733-36).

66 Yuri Burda *et al.*, Large-Scale Study of Curiosity-Driven Learning," *arXiv*, 2018.

67 Justine E. Hoch, Sinclaire M. O'Grady, and Karen E. Adolph, *It's the Journey, Not the Destination: Locomotor Exploration in Infants*, "Developmental Science", 22, 2, 2018, e12740.

68 Danyang Han, Karen E. Adolph, *The Impact of Errors in Infant Development: Falling Like a Baby*, "Developmental Science", 24, 5, 2021, e13069.

69 Karen E. Adolph *et al., How Do You Learn to Walk? Thousands of Steps and Dozens of Falls Per Day*, "Psychological Science", 23, 11, 2012, pp. 1387-1394.

70 Esther Thelen, Beverly D. Ulrich, Peter H. Wolff, *Hidden Skills: A Dynamic Systems Analysis of Treadmill Stepping During the First Year*, University of Chicago Press, 1991; A. Clark, *Being There*, cit.

71 E. Thelen, B.D. Ulrich, P.H. Wolff, *Hidden Skills*, cit.

72 Whitney G. Cole, Jesse M. Lingeman, and Karen E. Adolph, *Go Naked: Diapers Affect Infant Walking*, "Developmental Science", 15, 6, 2012, pp. 783-790; Meghan Slining *et al.*, *Infant Overweight Is Associated with Delayed Motor Development*, "The Journal of Pediatrics", 157, 1, 2010, pp. 20-25.e1; Lana B. Karasik *et al., Gahvora Cradling in Tajikistan: Cultural Practices and Associations with Motor Development*, "Child Development", 94, 4, 2023, pp. 1049-1067.

fundamental starting point to study the input a child receives[73], mirroring the description of the visual world from an egocentric perspective by Gibson[74]. These studies have revealed the rich environments where children grow up, and allow the specification of the information available to children at any point in time; this prompted some authors[75] to discuss children's early environment as a "curriculum for learning". Yet, current theoretical discussions rarely go beyond descriptions of the information available and do not provide a full assessment of the importance of the specific motor and body developmental factors beyond the emergence of specific skills. Here I will provide a brief analysis based on embodied aspects of word learning and face processing.

Learning the relationship between a word and the object it refers to is a potentially complex process, since the world contains a large number of potential referents. However, the problem space for 18-20 month-old toddlers' is greatly reduced because the number of potential referents in their visual field is limited by their short arms[76]. The cognitively complex problem of identifying the correct object is simplified by an embodied process, just as described by the accounts by Gibson, Clark, Varela and colleagues. However, even though there is evidence that input from the child's perspective is indeed easier to learn[77], it is not clear whether this reduction is necessary for learning words by non-embodied means. The three accounts also differ in their description of the extent of the externalization of this process. Whereas for Clark, internal cognitive processes are supplemented by external, embodied processes, Gibson and Varela *et al.* would suggest that children's short arms *are* part of the child's cognitive system.

In other cases, embodied contributions are not just supplementing learning and development, they provide its very foundation, as exemplified by the acquisition of a face model during infancy. Experience of faces appears to be necessary – children born with visual cataracts that are not treated within a specific time frame will fail to acquire a fully developed face model[78]. However, children's exposure to faces is enabled by their long period of dependency where they experience faces on a frequent basis during caregiver-infant interac-

[73] Jeremy I. Borjon *et al., A View of Their Own: Capturing the Egocentric View of Infants and Toddlers with Head-Mounted Cameras*, "Journal of Visualized Experiments", 140, 2018, A58445.

[74] J.J. Gibson, *The Ecological Approach*, cit.

[75] L.B. Smith *et al., The Developing Infant*, cit.

[76] Chen Yu *et al.*, *Two Views of the World: Active Vision in Real-World Interaction,* "Proceedings of the 29th Annual Meeting of the Cognitive Science Society", 29, 2007, pp. 731-736.

[77] Daniel Yurovsky, Linda B. Smith, Chen Yu, *Statistical Word Learning at Scale: The Baby's View Is Better*, "Developmental Science", 16, 6, 2013, pp. 959-966.

[78] L.B., Smith *et al., The Developing Infant*, cit.

tions[79]. This aspect of their development is potentially constitutive of their social experience of others by contributing to the development of face perception in general[80]. There are also cases where embodied processes constrain learning in ways that are not anticipated by non-embodied learning accounts. For example, Morse *et al.*[81] found that children's referential understanding of words to hidden referents can be interrupted by changes of posture, as predicted by simulations using robots. Here, embodied accounts of learning provide novel predictions about children's learning that go beyond cognitive explanations.

12. *A developmental perspective on extended cognition*

Developmental psychology can also contribute to a better understanding of extended processes. Gibson[82] described the ecological information available to different organisms in great detail. The spirit of this research continues in the works of many other developmental researchers[83]. Many of these works have focused on specific motor and embodied abilities and specific skills, such as word learning or exploration. The emphasis on ecologically relevant behaviors and skills is a strength of this line of research, but makes it difficult to compare its results with more traditional research investigating more abstract forms of learning. Developmental research has been explicitly referenced in foundational texts of the enactivist literature. Varela *et al.* specifically identify Piaget as a predecessor of enactivist thinking in development due to his focus on the child as an explorer of learning opportunities. A developmental perspective can also help to disentangle the underlying processes that lead to enacted and extended forms of behaviour. For example, the broader field of embodied cognition has accumulated a number of failed replications for embodied accounts of cognition[84] and providing develop-

[79] Swapnaa Jayaraman, Caitlin M. Fausey, L.B. Smith, *The Faces in Infant-Perspective Scenes Change over the First Year of Life*, "PLOS ONE", 10, 5, 2015, e0123780; Swapnaa Jayaraman, L.B. Smith, *Faces in Early Visual Environments Are Persistent Not Just Frequent*, "Vision Research", 157, 2019, pp. 213-221.

[80] L.B., Smith *et al.*, *The Developing Infant* cit.

[81] Anthony F. Morse, Viridian L. Benitez, Tony Belpaeme *et al.*, *Posture Affects How Robots and Infants Map Words to Objects*, "PLoS ONE", 10, 3, 2015, e0116012.

[82] J. J. Gibson, *The Ecological Approach to Visual Perception*, cit.

[83] L. B. Karasik, C. S. Tamis-LeMonda, K. E. Adolph *Transition from Crawling*, cit.; Chen Yu and Linda B. Smith, *Embodied Attention and Word Learning by Toddlers*, "Cognition", 125, 2, 2012, pp. 244-62; K. E. Adolph, J. E. Hoch, *Motor Development*, cit.

[84] Dermot Lynott *et al.*, *Replication of 'Experiencing Physical Warmth Promotes Interpersonal Warmth' by Williams and Bargh (2008)*, "Social Psychology", 45, 3, 2014, pp. 216-222; Lincoln J. Colling *et al.*, *Registered Replication Report on Fischer, Castel, Dodd, and Pratt (2003)*, "Advances in Methods and Practices in Psychological Science", 3, 2, 2020, pp. 143-162.

mental accounts can help to specify under which contexts and what forms of embodiment we can expect to find[85]. However, by investigating developmental trajectories it is also possible to test the underlying assumptions of embodied accounts. For example, it had been suggested that spatial biases in number representation are due to the directional biases in finger counting or reading. However, developmental research showed that these biases are present before children learn to read or count, and are even present in newborns. Instead they might be better explained by anatomical differences in hermispheric responses to different spatial frequencies[86]. Although the new account places the explanation for directional biases back in the head, it rests on anatomical features that have knock-on effects on how a number learner acts and interacts with the environment, allowing for a rich account of the acquisition of number understanding later in life.

13. *Conclusion*

Extending developmental psychology beyond the brain into the body and the environment provides a fruitful avenue into understanding development and generating novel hypotheses on the emergence of human (and non-human) cognitive abilities. Understanding development from the perspective of the learner as an active agent embedded in their environment can provide us with descriptions of the input available to learners that provide a more complete and relevant description of the information learners have at their disposition. But as much as these extended and embodied perspectives inform developmental psychology, they can profit from rich descriptions provided by developmental psychology.

[85] Samuel Shaki, Martin H. Fischer, *How Do Numbers Shift Spatial Attention? Both Processing Depth and Counting Habits Matter*, "Journal of Experimental Psychology: General", 153, 1, 2024, pp. 171-183.

[86] Arianna Felisatti *et al., A Biological Foundation for Spatial–Numerical Associations: The Brain's Asymmetric Frequency Tuning*, "Annals of the New York Academy of Sciences", 1477, 1, 2020, pp. 44-53.

Emotional displays as windows on the cultural world: open directions for developmental research

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Abstract: The emotional expressions exhibited by others are crucial tools to retrieve relevant social information. This is particularly apparent in *affective observation*, where observing emotional reactions in third-party interactions enables observers to safely acquire cultural information essential for navigating complex social environments, especially when encountering unfamiliar and "culturally opaque" content. The idea that novel members of a social group, such as infants and young kids, can use others' emotional expressions to assimilate unfamiliar content aligns with research indicating that humans, from a very early developmental stage, actively seek and selectively filter information to understand their environments (i.e., selective trust). However, much remains to be clarified regarding the developmental progression of the mechanisms involved in the strategic retrieval and utilization of emotional cues for cultural learning. Here, building upon a review of current theories of affective social learning and focusing on the active and selective exploration of the environment by naïve learners, we propose new directions for developmental research. Specifically, we highlight the need to investigate how the observation of emotional displays contributes to the acquisition of culturally relevant knowledge and to identify additional factors that may impact this process. The proposed research directions aim to contribute to a deeper understanding of the complex interplay between emotion and cognition in cultural learning throughout development.

Keywords: Emotional displays, cultural learning, observational learning, cognitive development.

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1. *Introduction*

Emotions are thought to have played a crucial role in the evolution of humans and other animals, acting as adaptive responses to environmental stimuli[1]. They assist individuals in making quick and effective decisions in reaction to threats and opportunities. Emotions are functional not only at the intrapersonal level but also convey critical information about others. For instance, emotional displays, such as facial expressions of emotion, can be used to predict others' behavioral intentions (e.g., approach or avoidance) and tendencies[2], thus serving as a valuable source of information for navigating the social environment. Indeed, many theories suggest that while the original adaptive function of emotions and affective displays was related to internal physiological regulation, they evolved to fulfill social functions as well, as posited in the "two-stage model of emotion-expression"[3]. In this context, emotional displays are instrumental in managing social interactions[4] and influencing the thoughts and actions of others[5].

There is still much to learn about the evolution of emotional displays, their signaling value[6], and their social function[7]. However, there is substantial evidence that displays of emotion can be viewed as vessels of information accessible to observers[8], which provide insights into the expressers' appraisal

[1] Charles Darwin, *The Expression of the Emotions in Man and Animals*, John Murray, London 1872; Azim F. Shariff, Jessica L. Tracy, *What Are Emotion Expressions For?*, "Current Directions in Psychological Science", 20, 6, 2011, pp. 395-399.

[2] Reginald B. Adams, Nalini Ambady, Neil C. Macrae, and Robert Kleck, *Emotional Expressions Forecast Approach-Avoidance Behavior*, "Motivation and Emotion", 30, 2, 2006, pp. 177-186.

[3] John Tooby, Leda Cosmides, *The Past Explains the Present*, "Ethology and Sociobiology" 11, 4-5, 1990, pp. 375-42.Gerben A. van Kleef and Stéphane Côté, *The Social Effects of Emotions*, "Annual Review of Psychology", 73 1, 2022, pp. 629-658.

[4] Dacher Keltner, Disa Sauter, Jessica Tracy, and Alan Cowen, *Emotional Expression: Advances in Basic Emotion Theory,* Journal of Nonverbal Behavior 43, 2, 2019, pp. 133-160; Azim F. Shariff , Jessica L. Tracy, *What Are Emotion Expressions For?*, cit., pp. 395-399.

[5] Roy F. Baumeister, Kathleen D. Vohs, Nathan C. DeWall, and Liqing Zhang, *How Emotion Shapes Behavior: Feedback, Anticipation, and Reflection, Rather Than Direct Causation*, "Personality and Social Psychology Review", 2, 2007, pp. 167-302; Matthew J. Hertenstein and Joseph J. Campos, *The Retention Effects of an Adult's Emotional Displays on Infant Behavior,* Child Development 75, 2, 2004, pp. 595-613; Brian Parkinson, *Emotions Are Social,* "British Journal of Psychology" 87, 4, 1996, pp. 1071-1084.

[6] Lisa Feldman Barrett, *Was Darwin Wrong About Emotional Expressions?*, "Current Directions in Psychological Science", 20, 6, 2011, pp. 400-406.

[7] Brian Parkinson, *Do Facial Movements Express Emotions or Communicate Motives?*, "Personality and Social Psychology Review", 9, 4, 2005, pp. 278-311; G. van Kleef and S. Côté, *The Social Effects of Emotions*, cit., pp. 629-658.

[8] Shlomo Hareli, Ursula Hess, *The Social Signal Value of Emotions*, "Cognition & Emotion", 26, 3, 2012, pp. 385-389.

of a referent or their internal state[9]. In fact, emotional displays can rapidly convey relevant information to conspecifics[10], even when such emotions are displayed unintentionally and non-ostensively. As De Leersnyder[11] noted: "emotions are not merely subjective feelings, they are, above all, stances in our social world" (p. 208). Furthermore, Gergely and Kiraly suggest that, given their evolved communicative function, social emotions may be regarded as "special types of ontological kind concepts that form part of the culturally shared ontological kind categories that humans possess and have in common with other social agents in their cultural community"[12] (p. 101).

Since the recognition of others' emotional expressions is crucial to navigate the social environment and to anticipate others' behavior and attitudes, humans have developed an adaptive capability to identify and disambiguate emotional displays and their target[13], a skill that seems to appear at a very young age, as shown by previous research[14]. Additionally, while the debate on the universality of emotional expressions continues, they seem to be pervasive in every society and to share many cross-cultural similarities[15], particularly for basic valences of emotions such as anger and happiness[16]. Therefore, given the critical role of the observation of emotional displays for naïve members in

[9] Ursula Hess, Agneta Fischer, *Emotional Mimicry: Why and When We Mimic Emotion*s, "Social and Personality Psychology Compass", 8, 2, 2014, pp. 45-57.

[10] Robert James R. Blair*, Facial Expressions, Their Communicatory Functions and Neuro–Cognitive Substrates*, C.D. Frith, D.M. Wolpert (eds), "Philosophical Transactions of the Royal Society of London. Series B: Biological Sciences", 358, 1431, 2003, pp. 561-572.

[11] J. De Leersnyder, *Insights from culture and emotion research for affective social learning: Emotional enculturation and acculturation,* in Daniel Dukes, Fabrice Clément (eds.), *Foundations of affective social learning: Conceptualizing the social transmission of value*, Cambridge University Press, 2019, pp. 205-233.

[12] Gyorgy Gergely, Idiko Kiraly, *Natural pedagogy of social emotions*, in D. Dukes, F. Clément (eds.), *Foundations of affective social learning*, cit., pp. 87-114.

[13] Magali Batty, Margot J. Taylor, *Early Processing of the Six Basic Facial Emotional Expressions,* "Cognitive Brain Research", 17, 2003, pp. 613-620.

Christian Mumenthaler, David Sander, Antony Manstead, *Emotion Recognition in Simulated Social Interactions*, "IEEE Transactions on Affective Computing", 2018.

[14] Sabine Hunnius, *Facing Threat: Infants' and Adults' Visual Scanning of Faces with Neutral, Happy, Sad, Angry, and Fearful Emotional Expressions*, "Cognition & Emotion", 25, 2011, pp. 193-205; Ann T Phillips, Henry M Wellman, and Elizabeth S Spelke, *Infants' Ability to Connect Gaze and Emotional Expression to Intentional Action*, "Cognition", 85, 2002, pp. 53-78.

[15] Paul Ekman, Wallace V. Friesen, *Constants across Cultures in the Face and Emotion*, "Journal of Personality and Social Psychology", 17, 1971, pp. 124-129; Hillary A. Elfenbein, Nalini Ambady, *On the Universality and Cultural Specificity of Emotion Recognition: A Meta-Analysis*, "Psychological Bulletin", 128, 2002, pp. 203-235.

[16] Paul Ekman, Daniel Cordaro, *What Is Meant by Calling Emotions Basic*, "Emotion Review", 3, 2011, pp. 364-370; D. Keltner, D. Sauter, J. Tracy, and A. Cowen, *Emotional Expression: advances in basic emotion theory*, cit.; Michelle S. M. Yik, James A. Russell, I*nterpretation of Faces: A Cross-Cultural Study of a Prediction from Fridlund's Theory*, "Cognition & Emotion", 13, 1999, pp. 93-104.

determining appropriate behavior in unfamiliar contexts and assimilating the complex cultural content necessary to integration in a social group[17], future research should empirically investigate how emotional cues facilitate the formation of predictions and judgments about others' expectations and evaluations. This would involve identifying social rules and shared evaluations, which can ultimately influence behavior (e.g., avoiding actions associated with negative reactions to avoid punishment and adverse consequences) and beliefs concerning the value of a certain activity, object, action, or situation.

In this context, building on recent conceptualizations concerning the affective mechanisms underlying cultural learning, we propose to highlight open directions for future developmental research. Specifically, future research should investigate the proactive role of infants and young children in seeking information (i.e., information-seeking), discerning reliable sources (i.e., epistemic trust), and utilizing emotional information to strategically learn about their environment beyond direct teaching and instruction-based contexts (i.e., observational learning).

2. *Emotional displays as social information*

The emphasis on the interpersonal significance of emotional displays has led to many attempts to describe how emotions influence social life and the navigation of our cultural environment[18]. An illustration of this is the "Emotions as social information" (Easi) theory[19], which proposes that emotions act as tools to enhance coordination among individuals and to facilitate learning in social settings[20]. Specifically, the theory suggests that emotional displays can trigger affective reactions (e.g., emotion contagion) and inferential processes, which in turn affect observers' appraisal of the situation (i.e., social appraisal), ultimately influencing observers' attitudes and behavior[21].

Furthermore, alternative views on emotions as social information, such

[17] D. Dukes, F. Clément, *Foundations of Affective Social Learning,* cit.

[18] Shlomo Hareli, Brian Parkinson, *What's Social About Social Emotions?*, "Journal for the Theory of Social Behaviour", 38, 2008, pp. 131-156.

Michael Lewis, Jeannette M. Haviland-Jones, and Lisa Feldman Barrett (eds.), *Handbook of Emotions*, 3rd ed, 2008.

[19] Gerben A. Van Kleef, *How Emotions Regulate Social Life: The Emotions as Social Information (EASI) Model*, "Current Directions in Psychological Science", 18, 2009, pp. 184-188.

[20] Gerben A. Van Kleef, Evert A. Van Doorn, Marc W. Heerdink, and L. F. Koning, *Emotion Is for Influence*, "European Review of Social Psychology", 22, 2011, pp. 114-163.

[21] Brian Parkinson, Gwenda Simons, *Affecting Others: Social Appraisal and Emotion Contagion in Everyday Decision Making*, "Personality and Social Psychology Bulletin", 35, 2009, pp. 1071-1084.

as the Spec (Social perception of emotions in context) framework[22], propose that observing emotional cues can also lead to judgments about the norms endorsed by a specific social group. Emotional displays may also be used to infer which emotional response is expected to be displayed in a specific situation ("appropriate reaction"), based on the previously observed evaluations. The anticipation of a particular emotional reaction is also related to the identification of specific social norms and standards. For instance, an emotional reaction can violate an expectation (i.e., an emotional display rule) either qualitatively (e.g., expressing an inappropriate emotion) or quantitatively (e.g., expressing the appropriate emotion but with inappropriate intensity)[23]. Therefore, emotional information provides insights into the expectations and evaluations of others, enabling the formation of predictions about their future reactions to a particular event or situation[24]. This is particularly useful for navigating the complex social environments humans inhabit. In fact, others' emotional expressions can guide new, inexperienced learners (e.g., infants and young children) in understanding how to act or assess a situation, particularly in ambiguous situations typical of humans' socio-cultural contexts, which are characterized by numerous rituals, conventional social practices, and specific ways of behaving.

The uncertainty often inherent in cultural content is linked to a crucial factor in the processing of emotional information: the observer's epistemic motivation, which refers to an observer's inclination to learn more about a specific situation. This motivation leads to more accurate and intense processing of emotional information[25]. As suggested by Bruder and colleagues under the uncertainty hypothesis[26], in unfamiliar contexts, indirect emotional information becomes an essential tool for learning about the environment and others. Novel, ambiguous, and uncertain situations are believed to increase an observer's epistemic motivation, making emotional information more likely to provoke counterfactual thinking, attributional activity, and formation of anticipations[27]. Consequently, this enhances the predictive power of strategic inferences based on emotional cues[28].

22 S. Hareli and U. Hess, *The Social Signal Value of Emotions*, cit., pp. 385-389.

23 G. van Kleef and S. Côté, *The Social Effects of Emotions*, cit., pp. 629-658.

24 B. Parkinson, G. Simons, *Affecting Others*, cit.

25 C. Mumenthaler, D. Sander, and A. Manstead, *Emotion Recognition in Simulated Social Interactions*", cit.; Van Kleef *et al.*, *Emotion Is for Influence*, cit., pp. 114-163.

26 Martin Bruder, Agneta Fischer, and Antony S. R. Manstead, *Social Appraisal as a Cause of Collective Emotions*, in Christian von Scheve and Mikko Salmela (eds.), *Collective Emotions*, Oxford University Press, 2014, pp. 141-155.

27 F. Baumeister, K.D. Vohs, N.C. DeWall, and L. Zhang, *How Emotion Shapes Behavior*, cit., pp. 167-203.

28 Gerben A. Van Kleef, Carsten K.W. De Dreu, and Antony S.R. Manstead, A*n Interperson-*

Naïve learners, such as infants and young children, may discern expected behaviors and rules in unfamiliar social situations by interpreting others' emotional expressions (e.g., an angry reaction may signal the violation of a social norm). Thus, observing others' emotional displays serves as a crucial avenue for acquiring unfamiliar cultural content[29]. Observers can gauge the appropriateness of behaviors by observing others' affective displays[30], making them attuned to emotional signals. Conversely, emotional displays are used by the expressers to teach what is 'good', 'allowed', or 'normal' within their community. Overall, affective processes are increasingly recognized as pivotal in driving fundamental cognitive mechanisms like attention, learning, and decision-making. They are also thought to play a major role in how we determine the cultural values shared in our social environments. Consequently, it is not surprising that a publication co-authored by over sixty researchers worldwide[31] inquired whether we are entering a new epoch of cognitive research: the era of affectivism. Despite the burgeoning interest in the impact of emotions on social life, our understanding of the processes underpinning the computation of emotional information and its developmental trajectory remains limited, with a notable absence of systematic exploration in the various dimensions that might influence affective cultural learning.

3. *Affective Social Learning*

A recent framework that explores the pivotal role of affective processes in transmitting culturally shared values is the Affective Social Learning (Asl) framework[32]. The Asl account delineates a continuum ranging from simple, unintentional, non-ostensive and automatic learning processes to more elaborated ones, where social interaction, intentionality, and joint commitment (between "learner" and "teacher") play a fundamental role. This continuum is crucial for the transmission and acquisition of cultural

al Approach to Emotion in Social Decision Making, "Advances in Experimental Social Psychology", 2010, pp. 45-96.

29 D. Dukes, F. Clément, *Foundations of Affective Social Learning,* cit.

30 Antony S.R. Manstead and Agneta H Fischer, *Social Appraisal: The Social World as Object of and Influence on Appraisal Processes*, in Klaus R Scherer, Angela Schorr, and Tom Johnstone (eds.), *Appraisal Processes in Emotion*, Oxford University Press, New York 2001.

31 Daniel Dukes, Kathryn Abrams, Ralph Adolphs… and David Sander, *The Rise of Affectivism*, "Nature Human Behaviour", 5, 2021, pp. 816-820.

32 F. Clément, D. Dukes, A*ffective Social Learning: A Lens for Developing a Fuller Picture of Socialization Processes*, in D. Dukes, Andrea C. Samson, Eric A. Walle, *The Oxford Handbook of Emotional Development*, Oxford University Press, 2022.

values and, more broadly, unfamiliar cultural content. The Asl framework encompasses four primary dimensions, illustrated in Figure 1: (i) Emotion contagion, (ii) Affective observation, (iii) Social referencing and (iv) Natural pedagogy. While these dimensions represent distinct phenomena, they should be considered as regions of a continuum which sometimes overlap, without clear-cut distinctions between them.

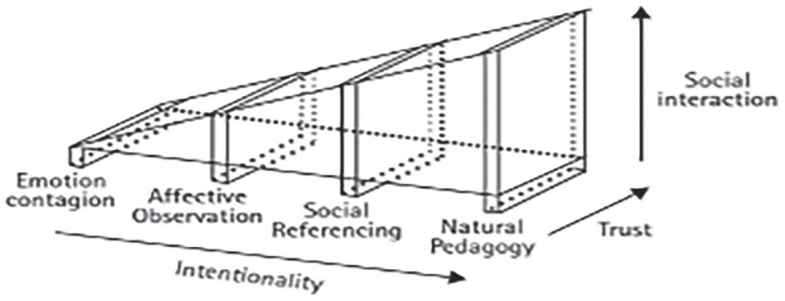

Fig. 1. D. Dukes, F. Clément, *Foundations of Affective Social Learning,* cit.

On the left side of the spectrum, emotional contagion refers to the process by which one person's emotion or mood can be directly influenced by others' displays of emotion[33], such as a group of people cheering at the stadium or getting excited about an event, subsequently influencing the person's attitudes and behavior. This phenomenon, sometimes called "primitive emotional contagion" or "affective infusion", is thought to enhance interpersonal understanding, closeness, and coordination among the members of a group[34]. It does not involve an intentional seeking of information from the "learner" or a deliberate intention to transmit specific information from the 'teacher(s)': instead, emotional contagion represents the most basic and automatic process of social learning involving emotions[35].

A more complex, yet still basic mechanism is affective observation, also

[33] Lars-Olov Lundqvist, Ulf Dimberg*, FaciaI Expressions Are Contagious*, "Journal of Psychophysiology", 9, 3, 1995, pp. 203-2011.

[34] Sigal G. Barsade, *The Ripple Effect: Emotiona*l Contagion *and Its Influence on Group Behavi*or, "Administrative Science Quarterly", 47, 2002, pp. 644-675.

[35] For a review, see Hillary Anger Elfenbein, *The Many Faces of Emotional Contagion: An Affective Process Theory of Affective Linkage*, "Organizational Psychology Review", 4, 2014, pp. 326-362.

known as emotional eavesdropping[36]. This concept describes how a 'learner' actively seeks and gathers pertinent information by observing interactions between others[37]. Unlike traditional learning scenarios, in affective observation, the 'teacher' does not deliberately aim to impart any specific knowledge to the 'learner'. Rather, the learner proactively seeks out and acquires information indirectly through observing the emotional expressions of others. Affective observation is particularly interesting in the context of the non-explicit transmission of social information, as the learner actively observes others' spontaneous affective reactions to infer the value of an event, activity, or person in absence of an instruction-based context, characterized by direct interaction and recognition of communicative intentions from the 'teacher'.

As the complexity of social interactions increases, social referencing comes into play. This phenomenon occurs when a "learner", faced with an ambiguous and unfamiliar stimulus, intentionally looks at a knowledgeable individual who responds with guidance about how to appraise it by displaying an emotional cue (e.g., infants relying on the evaluation of a caregiver whether continuing to move or stop when encountering a cliff [38]) that will influence the learner's behavior. In social referencing, direct social interaction and the role of a communicative intention from the teacher are more significant[39], but to a lesser extent than in mechanisms at the right end of the spectrum, where the learning and teaching mechanisms of natural pedagogy are found.

The natural pedagogy hypothesis proposes that humans have developed species-specific adaptive cognitive mechanisms that enhance the learnability and the generalizability of shared cultural knowledge[40]. Knowledgeable individuals in a social group are naturally inclined to ostensively communicate their knowledge to naïve conspecifics to facilitate their cultural learning process. Conversely, "novice learners" (e.g., infants) have a natural inclination to learn from knowledgeable individuals[41], displaying great sensitivity to ostensive signals (e.g., "direct eye-contact", "eyebrow raising", "being addressed by their name") that indicate teaching contexts. Furthermore, information

[36] Betty M. Repacholi and Andrew N. Meltzoff, *Emotional Eavesdropping: Infants Selectively Respond to Indirect Emotional Signals*, "Child Development", 78, 2007, pp. 364-378.

[37] D. Dukes, F. Clément, *Foundations of Affective Social Learning*, cit.

[38] James F. Sorce, Robert N. Emde, Joseph J. Campos, and M. D. Klinnert, *Maternal Emotional Signaling: Its Effect on the Visual Cliff Behavior of 1-Year-Olds*, "Developmental Psychology", 21, 1985, pp. 195-200.

[39] For a review, see Eric A. Walle, Peter J. Reschke, and Jennifer M. Knothe, *Social Referencing: Defining and Delineating a Basic Process of Emotion*, "Emotion Review", 9, 2017, pp. 245-252.

[40] Gergely Csibra and György Gergely, *Natural Pedagogy as Evolutionary Adaptation*, Philosophical Transactions of the Royal Society B: Biological Sciences 366, 2011, pp. 1149-1157.

[41] Gergely Csibra and György Gergely, *Natural Pedagogy*, "Trends in Cognitive Sciences" 13, 2009, pp. 348-353.

about a specific referent (an object or an action), communicated in presence of ostensive signals, is interpreted as conveying universally shared cultural knowledge, meaning that the manifested knowledge is represented as relevant and generalizable information shared by other members of the social group[42]. Finally, "novice learners" are not only able to recognize relevant information transmitted to them but also actively seek out this kind of information. For example, infants use pointing to express their wish to receive information about a specific referent[43] and show a tendency to actively seek out relevant information from emotional expressions of others[44].

4. *Beyond teaching: an active exploration of the environment*

The Asl framework highlights that, beside the significant benefits emphasized by the natural pedagogy approach, there appear to be alternative means for accessing and facilitating the transmission of shared cultural knowledge. These methods do not necessarily rely on scaffolding naïve members' learning processes through teaching mechanisms characterized by the primacy of direct communication.

One particularly notable method is affective observation, where naïve learners, such as infants or young children, take an active role in retrieving and utilizing information to learn about their environments without engaging in direct interaction with caregivers or other individuals[45]. However, much remains to be explored concerning the development of the abilities required to utilize affective observation effectively. This involves the observational learning of emotional displays to make both predictions and evaluations that assist in navigating diverse cultural contexts.

This direction presents a significant opportunity for future research. In fact, as highly emphasized, emotional displays have evolved to quickly convey socially relevant information, helping individuals in optimizing their learning about the environment. Moreover, observational learning such as affective observation, is a critical tool for extracting relevant information about the environment beyond formal teaching contexts. This process avoids the risks as-

[42] Katalin Egyed, Ildikó Király, and György Gergely, *Communicating Shared Knowledge in Infancy*, Psychological *S*cience 24, 2013, pp. 1348-1353;. G. Gergely, K. Egyed, I. Király, *On Pedagogy,* "Developmental Science", 10, 2007, pp. 139-146.

[43] Victoria Southgate, Catharine van Maanen, Gergely Csibra, *Infant Pointing: Communication to Cooperate or Communication to Learn?,* "Child Development" 78, 2007, pp. 735-740.

[44] Sabina Pauen, Stefanie Hoehl, *Preparedness to Learn About the World: Evidence from Infant Research*, in Thiemo Breyer (ed.), *Epistemological Dimensions of Evolutionary Psychology*, Springer, New York 2015, pp. 159-173.

[45] B.M. Repacholi, A.N. Meltzoff, *Emotional Eavesdropping*, cit., pp. 503-521.

sociated with first-hand experience and direct interaction with others, such as punishment and reputation-loss[46]. Consequently, infants and young children may have some predispositions for learning through observation of others' displays when not in teaching situations, thereby enhancing their learning opportunities while minimizing negative outcomes.

In support of this idea, previous research has shown that, from infancy, children are capable of engaging in observational causal learning even when the emotional display of an expresser is directed toward another individual[47]. These indirect emotional cues can regulate and influence behavior on multiple levels, including imitation, looking time, and interaction with objects[48]. This suggests that associative learning may assist infants in using information retrieved during affective observation to predict others' reactions to a specific action, thereby guiding and modulating their own behavior in light of the expectations shared by other individuals who are present at that moment[49], even after two weeks after being exposed to others' emotional displays[50]. These findings suggest that, from early development stages, naïve observers are prone to detect what is socially relevant and use another individual's emotional displays to gauge, to some extent, the most appropriate behavior to adopt in order to circumvent negative reactions.

The mentioned studies highlight the proactive role of infants and young children in engaging in social learning beyond formal teaching contexts. They do this to grasp the values of objects and to comprehend prevailing behavior norms. This readiness to acquire information from contextual emotional cues aligns with contemporary views of infants and young children as active and rational explorers, rather than merely passive receivers of information[51]. Indeed, prior research has shown that infants and young children actively explore their environments, seeking out information and employing certain cues to selectively learn from other individuals[52].

46 Andreas Olsson, Oriel Feldman Hall, Jan Haaker, and Tove Hnsler, *Social Regulation of Survival Circuits through Learning*, "Current Opinion in Behavioral Sciences", 24, 2018, pp. 161-167.

47 Bridget L. Callaghan et al., *Being the Third Wheel: Toddlers Use Bystander Learning to Acquire Cue-Specific Valence Knowledge*, "Journal of Experimental Child Psychology", 219, 2022, 105391.

48 M.J. Hertenstein, J.J. Campos, *The Retention Effects of an Adult*'s *Emotional Displays on Infant Behavior*, cit.; B.M. Repacholi, A.N. Meltzoff, *Emotional Eavesdropping*, cit., pp. 503-521.

49 Betty M. Repacholi, Andrew N. Meltzoff, Tamara S. Toub, and Ashley L. Ruba, I*nfants' Generalizations about Other People's Emotions: Foundations for Trait-like Attributions*, "Developmental Psychology", 52, 3, 2016, pp. 364-378.

50 B.L. Callaghan *et al*., *Being the Third Wheel*, cit.

51 W.E. Frankenhuis, A. Gopnik, *Early adversity and the development of explore–exploit tradeoffs*, "Trends in Cognitive Sciences", 27, 7, 2023, pp. 616-630.

52 Irene Cogliati Dezza, Eric Schulz, Charley M. Wu (eds.), *The Drive for Knowledge: The Science of Human Information Seeking*, Cambridge University Press, 2022.

5. *Attentive explorers: a selective attitude*

It is crucial to acknowledge that young children are not blank slates who uncritically accept everything they are told or observe[53]. Many studies have been conducted in the last years to explore human epistemic trust, finding support for the existence of specific mechanisms that filter communicated information from very early age, known as epistemic vigilance. For instance, studies have demonstrated that children as young as 3 can monitor an informant's accuracy, thereby assessing their competence and reliability[54], and exhibit selective trust. Additionally, there is evidence suggesting humans prefer information from benevolent sources. For instance, 3- and 4-year-olds are more likely to consider a benevolent informant (e.g., someone exhibiting kind behavior) as more reliable and trustworthy compared to a malevolent one (e.g., someone displaying an aggressive behavior)[55].

Competence, accuracy, and benevolence are key but not the sole cues for epistemic trust. Research has showed that children use a variety of cues to assess the reliability of incoming information, including consensus among sources[56] and the informant's familiarity[57]. Hence, information conveyed by a trustworthy and competent individual is likely to be perceived as being more salient and relevant than the information provided by an unreliable informant, and this might be true also for information retrieved from the observation of emotional displays. This assumption is in line with what has been called the "reliability hypothesis"[58] in the context of social appraisal, suggesting that the competence and trustworthiness of the source(s) of emotional information (i.e., the individuals displaying an emotional reaction) can influence an observer's likelihood to utilize such information to appraise the situation and form an evaluation. Furthermore, reliability traits might also be affected by factors related to group-related variables: emotional displays from group members, particularly those with high status within the group,

[53] F. Clément, *To Trust or Not to Trust? Children's Social Epistemology*, "Review of Philosophy and Psychology", 1, 2010, pp. 531-549; Paul L. Harris, Melissa Koenig, Kathleen H. Corriveau, and V.K. Jaswal, *Cognitive Foundations of Learning from Testimony*, "Annual Review of Psychology", 69, 2018, pp. 251-273.

[54] F. Clément, M. Koenig, P.L. Harris, *The Ontogenesis of Trust*, "Mind & Language", 19, 4, 2004, pp. 360-379; Kathleen Corriveau, Paul L. Harris, *Preschoolers Continue to Trust a More Accurate Informant 1 Week after Exposure to Accuracy Information*, "Developmental Science", 12, 1, 2009, pp. 188-193.

[55] Olivier Mascaro, Dan Sperber, *The Moral, Epistemic, and Mindreading Components of Children's Vigilance towards Deception*, "Cognition", 112, 2009, pp. 367-380.

[56] K.H. Corriveau, Maria Fusaro, P.L. Harris, *Going With the Flow: Preschoolers Prefer Nondissenters as Informants*, "Psychological Science", 20, 2009, pp. 372-377.

[57] K. Corriveau, P.L. Harris, *Choosing Your Informant: Weighing Familiarity and Recent Accuracy,* "Developmental Science", 12, 2009, pp. 426-437.

[58] M. Bruder, A. Fischer, A. Manstead, *Social Appraisal as a Cause of Collective Emotions*, cit.

tend to impact observers' affective reactions and evaluations more than those of strangers, out-group members, or unfamiliar individuals[59].

However, the issue extends beyond mere selective attributions of trustworthiness, as demonstrated by an expanding body of research that outlines the developmental trajectory of children's discernment in information gathering. From an early age, children are able to exploit patterns in their environments to refine the efficiency of their search strategies[60]. This sensitivity to context increases throughout the course of development, enabling children to better adapt their goal-directed behavior to their environments as they mature[61]. This adaptability is largely attributable to the extraction of statistical regularities[62] and understanding of categorical hierarchies[63], coupled with a growing ability to discern gaps in one's own knowledge[64].

6. *Curiosity in context*

It appears that both children and adults learn more quickly when information is accompanied by signals which make it perceived as being socially relevant. In situations where individuals had to learn associations between spontaneous cues and rewards, social cues were found to be the most efficient in directing attention and producing more rapid, robust associations[65]. This supports the view that it might be challenging to clearly demarcate the processing of affective information from a more general conception of information processing in the context of social learning[66]. Given that emotional

[59] Patrick Bourgeois, Ursula Hess, *The Impact of Social Context on Mimicry,* "Biological Psychology", 77, 3, 2008, pp. 343-352; Vincent Yzerbyt, Muriel Dumont, Daniel Wigboldus, and Ernestine Gordijn, *I Feel for Us: The Impact of Categorization and Identification on Emotions and Action Tendencies,* "British Journal of Social Psychology", 42, 2003, pp. 533-549.

[60] Costanza De Simone, Azzurra Ruggeri, *Searching for information, from infancy to adolescence*, in I. Cogliati Dezza, E. Schulz, C.M. Wu (eds.), *The Drive for Knowledge*, cit., pp. 77-100.

[61] Andreas Domberg, Karla Koskuba, Anselm Rothe, and A. Ruggeri, *Goal-Adaptiveness in Children's Cue-Based Information Search,* cit.

[62] Björn Medere, Jonathan D. Nelson, Matt Jones, and A. Ruggeri, *Stepwise versus globally optimal search in children and adults*, "Cognition", 191, 2019, A103965.

[63] Azzurra Ruggeri, Nora Swaboda, Zi Lin Sim, and Alison Gopnik, *Shake it baby, but only when needed: Preschoolers adapt their exploratory strategies to the information structure of the task*, "Cognition", 193, 2019, A104013.

[64] Kara Kedrick, Paul Schrater, Wilma Koutsaal, *The Multifaceted Role of Self-Generated Question Asking in Curiosity-Driven Learning*, "Cognitive Science", 47, 4, 2023, e13253.

[65] Angélina Vernetti, Tim J. Smith, Atsushi Senju, *Gaze-Contingent Reinforcement Learning Reveals Incentive Value of Social Signals in Young Children and Adults*, "Proceedings of the Royal Society B: Biological Sciences", 284, 2017.

[66] Kenneth A. Dodge, *Emotion and Social Information Processing*, in Judy Garber, Kenneth A. Dodge (eds.), *The Development of Emotion Regulation and Dysregulation*, Cambridge University

expressions from others are highly salient social signals, they are integral to social learning, serving as a crucial means through which infants and young children can develop the ability to make more complex deductions from their social surroundings.

Specifically, the processing of affective cues, especially when they are multimodal, emerges in infancy[67]. Moreover, by the age of 5, children can successfully process emotional displays that are not particularly nuanced[68] and seem to finally achieve adult-like interpretations of emotional displays around 10 years of age.

This early reliance on emotions for information may be due to the fact that their epistemic content is among the most salient in our environments[69]. Evidence of this includes children's ability to draw inferences from the behaviors and emotional displays of others. For instance, 12-month-olds already expect congruency between outcomes and emotional displays[70], but only around 5 years of age they are used to make inferences that help to generate new evidence and facilitate learning in others[71].

Moreover, the ecological approach to active learning is valuable because it takes into account one's environment and primarily focuses on goals defined externally. Recent related work also emphasizes the importance of intrinsic goals within the context of active learning[72], and how these goals can influence one's perception of information. This research challenges the often implicit assumption that views goals as external to the individual. Instead, it explores the hierarchy of goals that individuals navigate as they engage in decision-making behavior. Investigating the factors driving self-motivated learning and the cognitive resources one draws upon to implement it[73] has contributed to a deeper

Press, 1991, pp. 159-181.

67 Donna L. Mumme, Anne Fernald, Carla Herrera, *Infants' Responses to Facial and Vocal Emotional Signals in* a *Social Referencing Paradigm,* "Child Development", 67, 6, 1996, pp. 3219-3237.

Arlene S. Walker-Andrews, *Infants' Perception of Expressive Behaviors: Differentiation of Multimodal Information,* Psychological Bulletin 121, 1997, pp. 3219-3237.

68 Karine Durand, Mathieu Gallay, Alix Seignouric, Fabrice Robichon, and Jean-Yives Baudouin, *The Development of Facial Emotion Recognition: The Role of Configural Information,* "Journal of Experimental Child Psychology", 97, 1, 2007, pp. 14-27.

69 Yang Wu et al., *Emotion as Information in Early Social Learning,* "Current Directions in Psychological Science", 30, 6, 2021, pp. 468-475.

70 Peter J. Reschke, Eric A. Walle, Ross Flom, Darren Guenther, *Twelve-Month-Old Infants' Sensitivity to Others' Emotions Following Positive and Negative Events,* "Infancy", 22, 6, 2017, pp 874-881; Amy E. Skerry, Elizabeth S. Spelke, *Preverbal Infants Identify Emotional Reactions That Are Incongruent with Goal Outcomes,* "Cognition", 130, 2, 2014, pp. 204-216.

71 Hyowon Gweon, *Inferential Social Learning: Cognitive Foundations of Human Social Learning and Teaching,* "Trends in Cognitive Sciences", 25, 10, 2021, pp. 896-910.

72 Gaia Molinaro, Anne G.E. Collins, *A Goal-Centric Outlook on Learning,* "Trends in Cognitive Sciences", 27, 12, 2023, pp. 1150-1164.

73 Lucy M. Cronin-Golomb, Patricia J. Bauer, *Self-Motivated and Directed Learning across the*

understanding of an individual's desire for information. Given the significance of intrinsic motivation with regard to the interwoven phenomena of information search, curiosity, and active learning, it is also vital to consider how one's internal states and their regulation affect their interaction with information. Decades of infant research using the violation of expectation paradigm[74] have shown that there is an intrinsic drive to gather information from a very early age[75].

Furthermore, it appears that curiosity – the extent to which an individual is motivated to gather information from a particular source or within a particular domain – is mediated by one's perception of their informational environments[76]. This dynamic is further complicated by individuals' strong tendencies to avoid negatively valence information, leading to a reluctance to engage with content that could adversely affect their emotional states by generating social or physical uncertainty[77].

Even at the cost of accuracy, individuals often choose to expose themselves to information that provides personal validation[78]. This phenomenon, also referred to as the congeniality bias, is not just a passive behavior. Information is frequently used to enhance internal states, with individuals making predictions about the impact information might have on their affective states to inform their information-seeking behavior[79]. However, this is not limited to merely acquiring information; emotional states also influence how information is perceived. Emotional responses to information can affect both one's estimations of risk[80] and their corresponding behavior[81]. Therefore, the centrality of one's affective condition cannot be understated when considering learning in social contexts, as it skews both our interpretation of information and the

Lifespan, "Acta Psychologica", 232, 2023, A103816.

74 Aimee E. Stahl, Melissa Kibbe, *Great expectations: The construct validity of the violation-of-expectation method for studying infant cognition*, "Infant and Child Development", 31, 6, 2022, e2359.

75 Katarina Begus, Victoria Southgate, *Infant pointing serves an interrogative function,* "Developmental Science", 15, 5, 2022, pp. 611-617.

76 Katarina Begus, Victoria Southgate, *Curious Learners: How Infants' Motivation to Learn Shapes and Is Shaped by Infants' Interactions with the Social World*, in M.M. Saylor, P.A. Ganea (eds.), *Active Learning from Infancy to Childhood*, Springer International Publishing, 2018, pp. 13-37.

77 J.L. Howell, N.P. Lipsey, J.A. Shepperd, *Health Information Avoidance*, in Kate Sweeny, Megan L. Robbins, Lee M. Cohen (eds.), *The Wiley Encyclopedia of Health Psychology*, John Wiley & Sons, 2020, pp. 279-286.

78 William Hart, Dolores Albarracin, Alice H. Eagly, Inge Brechan, Matthew J. Lindberg, and Lisa Merrill, *Feeling Validated versus Being Correct: A Meta-Analysis of Selective Exposure to Information,* "Psychological Bulletin", 135, 4, 2009, pp. 555-588.

79 I. Cogliati Dezza, C. Maher, and Tali Sharot, *People Adaptively Use Information to Improve Their Internal States and External Outcomes,* "Cognition", 228, 2022.

80 Lara Bertram, Eric Schulz, Jonathan D. Nelson, *Subjective Probability Is Modulated by Emotions,* preprint PsyArXiv, 2021.

81 Daniel Thomas Jäger, Celine Behrens, and Jascha Rüsseler, *Current and Expected Affective Valence Interact to Predict Choice in Recurrent Decisions,* "Cognition and Emotion", 36, 2022, pp. 560-567.

amount of information exposure. It is therefore essential to take into account the affective states of individuals within any learning context when trying to understand the transmission of socially relevant information. Not only does the affective state of the individual skew their perception of their environments, but their observations of others' emotional displays inform their interpretations of the social structures they inhabit. Consequently, individuals of all ages use emotional displays to more effectively navigate their informational environments as they explore, learn, and interact with their social reality.

7. *Directions for future developmental research*

7.1 *Observed emotional displays and communication in acquiring shared cultural knowledge*

Recent advancements in social learning research have illuminated the dynamic role of infants and young children. These young members are not merely passive recipients of information but seem actively explore their environment to understand it. Observational learning, particularly of emotional displays, empowers individuals to actively acquire culturally shared knowledge and, more generally, socially relevant information, circumventing the costs and the risks associated with direct communication. However, the developmental trajectory of affective observation, specifically how emotional displays observed in third-party interactions facilitate cultural learning in the absence of ostensive teaching, remains under-explored.

Future research should systematically investigate the emergence of affective observation in developmental stages and describe how such a basic and low-level process may lead to an understanding of the many elements populating humans' complex cultural environments. More specifically, it would be relevant to empirically test how young learners use emotional displays directed at others to form generalized assumptions about the evaluations prevalent within a social group. This process of generalization is crucial for quickly assimilating social norms and rules from limited observations. Since the generalizability of social information has been primarily studied in relation to direct communication and teaching contexts[82], an open direction for future research is to investigate whether individuals generalize information retrieved through affective observation, even in total absence of communicative elements, or if emotional displays are invariably interpreted as being communicative signals (the absence of ostension merely represents a lesser degree of

[82] G. Gergely, K. Egyed, I. Király, *On Pedagogy*, cit., pp. 139-146.

communication). Since ostensive cues intentionally point out the relevance of the information transmitted, and automatic emotional displays offer more spontaneous access to other individuals' evaluations, future research should also consider whether there are any dimensions, such as automatic versus ostensive communication, along which emotional cues are hierarchically ranked in terms of epistemic value. Interestingly, the affective reactions which are perceived to be produced automatically, as opposed to the ones that are produced deliberately to achieve ostensive communication, may be seen as being more genuine and therefore more trustworthy.

7.2 *The active filtering and selection of information retrieved during affective observation*

Additionally, future research should also explore any additional factors influencing the perception and utilization of information retrieved through affective observation, such as the perceived reliability of the source of information (i.e., the expresser of the emotional reaction). Therefore, it would be relevant to investigate whether judgments of reliability, regarding the individual expressing the emotion, impact the perceived saliency and reliability of the retrieved information, as this might consequently affect the processing of emotional information and the tendency to interpret it as the signaling of universally shared cultural knowledge (i.e., an evaluation shared by all the individuals of a social group) or to discard it. Given these considerations, it would be important to investigate how reliability judgments based either on person-perception traits or on more explicit evaluations influence observers' filtering of emotional information. Testing whether either epistemic factors, such as knowledgeability and competence, or socially relevant factors, such as dominance status and pro-sociality, drive observers' selective trust in the expresser of an emotional display could provide valuable insights. Future experiments might also explore how the specificity of objectives influences the strategic use of emotional cues in goal-oriented tasks.

This is especially pertinent in goal-oriented tasks, where an individual aiming to achieve a specific goal may observe their environment, either deliberately or automatically, to guide their behavior towards that goal. Emotional cues or displayed traits signaling that an observed individual is unreliable could lead one to reconsider their reliance on that party. For instance, if a collaborator exhibits selfishness, lack of interest, or incompetence, they might be deemed replaceable. Similarly, respect or deference typically given to a leader or decision-maker might be redirected elsewhere. A relevant research direction could therefore be to examine how people's attitudes change towards someone

considered a reliable source of knowledge when they exhibit certain behaviors, and which cues are used to assess such status.

7.3 *From observation to (over-)imitation and transmission*

Moreover, if others' emotional displays are systematically generalized and used to detect social norms and standards, future research should also investigate how affective observation modulates imitation tendencies in infancy and childhood. Specifically, it would be relevant to study how positive and negative emotional feedback may impact the tendency to avoid or imitate particular behaviors throughout development. In fact, emotional cues become particularly important in unfamiliar and culturally opaque contexts, which are typical of our culturally diverse world and that can be extremely challenging for infants and young children[83]. Observing emotions could also shed light on how subtle, culturally specific practices, like the sequences of actions in cultural rituals that might not have a direct causal relevance, are passed on. Emotional expressions in these contexts could highlight the positive social value of these practices, encouraging observers to adopt them.

Finally, although the content transmitted may differ across cultures, the vehicle through which this transmission is achieved, i.e. affective displays, may be universal. Whether affective displays are one of the means by which human beings universally retain their cross-cultural adaptivity remains to be fully understood. While specific cues like a smile or a frown might have different meanings depending on the cultural context, the extent to which emotional expressions are universally used and understood as both communicative tools and valuable sources of information (both automatically and intentionally) could have significant implications for the role of affectivism as a means to study cognitive and behavioral patterns.

8. *Conclusion*

Overall, the observation of emotional displays could be a way to actively retrieve relevant social information, serving as a valuable tool for navigating complex cultural landscapes and learning the shared practices and values essential for integration into a social group. This is particularly true for naïve

[83] For example, when young children join kindergarten for the first time, where they are faced by many rules (e.g., shoes must be removed in specific areas and left in one particular cupboard) and social practices (e.g., how to play and coordinate with other kids during a specific game/ activity) that must be followed to be recognized as being part of the group. Another example is given by the different customs that have to be respected when dining together, or when greeting each other.

members of a social group, such as infants and young children, who can safely acquire shared cultural information through observation, helping them in forming expectations about others' evaluations and reactions in various situations.

The proposed future research directions aim to deepen our understanding of how individuals actively explore their environments by observing others' emotional expressions outside formal teaching settings. This is crucial to demonstrating that acquiring unfamiliar cultural content is possible without relying solely on instruction-based contexts and direct interaction, which has been the primary focus of past research on social learning in development.

In conclusion, a systematic description of affective observation throughout development, along with an empirical investigation of the mechanisms that allow infants and young kids to filter and strategically utilize emotional information, constitutes a significant area of research. This could enhance our understanding of how humans, from an early age, are able to actively navigate such complex cultural environments. This line of research could illuminate the ways in which we discern social norms and practices, ultimately influencing social behavior. More broadly, these open directions align with the recent emphasis on affective social learning, where emotions are recognized as key instruments in transmitting and acquiring cultural values.

Recensioni/Reviews

Pietro Omodeo, *Creazionismo ed evoluzionismo*, Nuova edizione a cura di Emilia Rota, Editrice Bibliografica 2022, pp. 280.

Pietro Omodeo fu storico della biologia nonché biologo egli stesso. Nato nel 1919, è morto ultracentenario nel 2024. Il suo saggio su *Creazionismo ed evoluzionismo*, da poco riedito da Editrice Bibliografica, usciva la prima volta nel 1984 per Laterza. Né la *Prefazione* né l'*Introduzione*, entrambe dell'autore, spiegano le differenze tra la prima e la seconda edizione, ma dall'esame delle note e dei riferimenti interni al testo si evince l'aggiornamento della bibliografia e delle note, poiché compaiono rimandi a opere pubblicate anche nell'ultimo decennio. Dal momento che non si tratta di un'opera di biologia sul creazionismo e sull'evoluzionismo, bensì di un'opera sulla storia dell'interazione tra creazionismo ed evoluzionismo, i quarant'anni non le pesano affatto, e da questo punto di vista l'unica pecca è il limite temporale della narrazione che si arresta alla fine degli anni '40 del Novecento, considerati un periodo di cesura e di repentini rivolgimenti in biologia. L'argomento trattato è a dir poco impegnativo, poiché presuppone un'erudizione impressionante e un'ammirevole acribia dell'autore, ma al tempo stesso non richiede qualità sovrumane al lettore: la narrazione è agile, poco viziata da tecnicismi, in grado di compendiare indigesti tomi di storia naturale degli ultimi quattro secoli in frasi essenziali e significative. Nel complesso l'obiettivo teorico dell'opera è semplice e consiste nel dimostrare due punti: (a) da un punto di vista storico creazionismo ed evoluzionismo non sono due teorie nettamente contrapposte, e (b) nel mezzo tra le due sono esistite varianti intermedie e contigue. Il libro però ha anche un altro merito fondamentale, benché solo implicito: (c) mostrare che persino la biologia, probabilmente considerata oggi una delle scienze della natura più importanti a livello accademico, medico ed economico, ha una storia di errori, di tentativi, di assurdità, di approssimazioni, sistematicamente ignorata dalla vulgata ottimistica e progressiva che generalmente se ne dà a livello mediatico e scolastico.

Il tema cardinale che avvia la storia della biologia moderna è la *generazione spontanea*: o più precisamente il continuo tentativo di confutarla. Uno dei primi a negarla è il medico inglese William Harvey nel 1651, quando sostiene che tutti gli animali nascono da uova e tutti i vegetali da semi. La sua negazione è però solo parziale: in linea di principio generazione spontanea e nascita da uova/semi dovrebbero contraddirsi, ma Harvey nega al tempo stesso che tutte le uova e tutti i semi nascano da viventi e ipotizza invece una *panspermia*, per cui uova e semi privi di genitori sarebbero disseminati ovunque pronti a nascere in qualunque momento. Più o meno nello stesso periodo Francesco Redi mette alla prova la teoria di Harvey con una serie di esperimenti sulla generazione degli insetti: i vermi della putredine nascono spontaneamente o hanno bisogno anch'essi di uova deposte da qualcuno? Redi giunge alla conclusione che senza mosche i vermi non nascono. La confutazione della generazione spontanea, come ogni teoria di biologia dell'epoca, deve affrontare due ostacoli: (a) il principio di autorità (prima di tutto l'Aristotele della Scolastica) e (b) le verità di fede. Redi è molto cauto, consapevole del processo (e della condanna) all'astronomia di Galilei. Anche per questo il suo sperimentalismo in biologia non adotta il metodo galileiano, principalmente per carenza di dati e misurazioni. In ogni caso lo sperimentalismo acerbo di Redi viene preso di mira da uomini di chiesa come padre Filippo Buonanni, il quale preferisce le uova diffuse ovunque di Harvey, conciliabili con la generazione spontanea prevista dai disegni dell'Onnipotente. Diventa chiaro che negare la generazione spontanea significa sminuire la Natura, cioè il potere di Dio. Come secondo argomento contro Redi, Buonanni richiama la logica aristotelica, com'è tipico della Scolastica, per delegittimare lo sperimentalismo in generale: per quanti esperimenti si conducano, si tratta sempre di casi particolari che non possono generare una legge universale. Alla fine del Seicento il dibattito prosegue con Marcello Malpighi e soprattutto con Antonio Vallisneri. Quest'ultimo prova a prendere sul serio l'ipotesi di Buonanni della generazione spontanea basata sull'aria e la mette alla prova sperimentalmente: per quanto gli esperimenti paiano inadeguati a produrre una legge universale, nondimeno sono assai adatti a confutarne una ritenuta tale, come quella di Buonanni. Il risultato è che, in assenza di aria e di uova introdotte dall'esterno, nei vasi pieni di putredine non nasce niente. A differenza dei precedenti critici della generazione spontanea, Vallisneri ha chiaro che ostacolo all'avanzamento della biologia non è solo la teologia ma, forse in misura maggiore, l'interpretazione scolastica della logica aristotelica e del concetto di causa finale. In altre parole Vallisneri preme per adottare in biologia unicamente la causa efficiente come l'unica davvero esplicativa e necessaria. In ogni caso, i protobiologi come Vallisneri sono costretti a perdere tempo in diatribe futili come quella relativa alla presenza o meno di parassiti intestina-

li già nei visceri di Adamo ed Eva o addirittura nella sola costola di Adamo.

Nei primi decenni del Settecento le critiche alla generazione spontanea sono sempre più accese e numerose: per esempio, il medico fiammingo Jan Swammerdam scrive ma non pubblica una *Biblia naturae*, ricchissima di dettagli sull'anatomia di insetti e molluschi, sulla base dei quali rigetta la generazione spontanea. Questa volta però essa viene respinta non solo perché in contraddizione con le osservazioni, ma anche perché, paradossalmente, incline all'ateismo o alla magia: Dio non può essere invocato per la nascita di qualunque vivente, poiché la sua sapienza e la sua potenza gli hanno permesso di progettare tutta la natura, nel piccolo e nel grande, in modo che essa si propaghi e prosperi autonomamente. La strategia di esaltare complessità e prodigiosità della natura a maggior gloria di Dio viene più volte ripresa, soprattutto da teologi protestanti, che nei primi anni del Settecento pubblicano libri come *Fisico-teologia*, *Astro-teologia*, *Idro-teologia* o *Insetto-teologia*. In qualche modo la tendenza del Settecento è inversa a quella del secolo precedente: ora i teologi negano la generazione spontanea e sostengono una forma di meccanicismo che presuppone un architetto divino, mentre la "avanguardia" dei biologi subodora un passato remoto di drastici cambiamenti a livello geologico e biologico, che sul versante teorico sfocia in una nuova forma di generazione spontanea della vita, stavolta non su basi magiche ma fisico-chimiche. Adesso sono gli atei a difendere l'ipotesi che la vita sia nata "spontaneamente" da forze deterministiche e materialistiche: che farsene della Provvidenza se abbiamo la gravitazione universale? Da un lato i teologi sostenitori del meccanicismo e dell'architetto divino accolgono il *preformismo* (secondo cui l'embrione è solo un adulto in miniatura) e il *creazionismo fissista* (secondo cui Dio ha creato ogni specie esistente inalterabile e inalterata), dall'altro i novelli sostenitori della generazione spontanea accolgono la teoria dell'*epigenesi* (secondo cui l'embrione si sviluppa da un germe indifferenziato) e l'intuizione dell'evoluzione delle forme viventi. Il più convinto e convincente tra questi ultimi è il giacobino Jean-Baptiste de Lamarck che introduce nell'evoluzionismo il determinismo democriteo, impostando la questione dell'evoluzione biologica su nuove basi.

Il secondo capitolo apre una parentesi sulla figura eclettica e bizzarra di un gesuita del Seicento, Athanasius Kircher, che meriterebbe una discussione a parte, quantomeno per il suo *Mundus subterraneus*, un'opera di geologia o meglio di "geocosmologia" su cui si modellerà lo scientismo esoterico ottocentesco invischiato nella teoria della "terra cava". Tuttavia il suo lascito naturalistico più significativo è l'insistenza sull'intrinseca trasformazione della natura, più tardi tradotta in termini di storia delle civiltà da Gianbattista Vico.

Il terzo capitolo ritorna al creazionismo fissista come contrapposto alla generazione spontanea, in particolare nelle opere di Vallisneri. Questi nega la

creazione spontanea per abbracciare creazionismo *e* meccanicismo cartesiano. Cartesio aveva supposto per la fisica che Dio al momento della creazione avesse impresso tutta la quantità di moto necessaria a far procedere l'universo per sempre: ora i biologi creazionisti suppongono una cosa simile per il mondo dei viventi, così che Dio avrebbe creato tutti i viventi di tutte le epoche future in una volta sola, immettendo le uova *preformate* (da cui il preformismo) delle progenie nei primi progenitori, nel caso umano in Adamo e/o in Eva (il dubbio è se questi "omuncoli" si trovino negli spermatozoi o negli ovuli). Oggi si discute dell'Eva mitocondriale, all'epoca si discuteva sulla gigantesca quantità di ovuli contenuti nelle ovaie dell'Eva biblica. Il creazionismo fissista, o detto anche *in actu*, è comunque un progresso rispetto al creazionismo *causaliter*, cioè continuamente causativo, perché Dio non è più implicato nella riproduzione di ogni nuova generazione di viventi, ma ha semplicemente architettato ogni cosa al meglio fin dall'inizio affinché proceda da sola. Viene così sgomberato il campo della biologia dai continui interventi miracolistici della Provvidenza e dalle altre "forze" pseudomagiche, oscure e cervellotiche, escogitate per spiegare l'inspiegabile. Il creazionismo fissista, oggi presentato come monolitico e polveroso, in realtà è piuttosto recente, solo settecentesco, e introdotto per liberare la biologia da creazionismi più retrivi e aristotelici, aprendo uno spiraglio per l'evoluzionismo. Il creazionismo *in actu* piace ai protestanti, non piace ai cattolici: la ragione sta nella diversa importanza attribuita dalle due confessioni alla Provvidenza. Potremmo dire che la storia della biologia è tarlata da un pregiudizio culturale che, millenni prima, Lucrezio constatava nel sacrificio di Ifigenia e che noi ora accolliamo ai numerosi passi falsi delle scienze naturali: *tantum religio potuit*.

D'altra parte, a ben vedere, la creazione *una tantum* non deve appaiarsi per forza a un creazionismo fissista: se si potesse mostrare che le specie sono cambiate rispetto al tempo della creazione, si aprirebbe la porta a una serie di teorie dell'evoluzione. È Vallisneri a fornire alcuni argomenti alla possibilità dell'evoluzione, proprio quando cerca di scongiurarla acrobaticamente: si tratta anzitutto dell'osservazione che, di tanto in tanto, nascono mostri deformi diversi dai genitori. Vallisneri ha anche un altro merito (involontari entrambi), quello di affrontare il problema della classificazione dei viventi sfruttando la nozione aristotelica di *definizione* costituita dal genere prossimo e dalla differenza specifica. Nella metà del Settecento Carl Linnaeus, per noi Linneo, imposta la tassonomia del regno dei viventi esattamente su queste basi. Malgrado il linguaggio aristotelico, Linneo è un meccanicista e conseguentemente un creazionista. Tuttavia il sistema di Linneo ha il difetto di presentarsi come statico, proprio quando le scoperte settecentesche intorno al microcosmo e al macrocosmo inducono a pensare che l'universo e la vita in esso siano decisamente più antichi di quanto si sospetti. È la geologia a spa-

lancare l'abisso del tempo e a negare quindi la cronologia biblica, i cui tempi impallidiscono di fronte a quelli geologici. Se l'aspetto e il clima della Terra sono cambiati nel corso delle ere e se gli esseri viventi cercano di sopravvivere nelle diverse condizione, allora sembra impossibile l'ipotesi fissista.

Nel Settecento si ha il ritorno del materialismo in chiave evoluzionistica. Di questo si occupa il quarto capitolo. Omodeo salda il clima culturale dinamico e prospettico delle scienze naturali settecentesche con *I viaggi di Gulliver* di Swift. A differire enormemente da un luogo all'altro non sono solo le culture e i valori umani ma anche la natura stessa, e questa soprattutto da un'epoca all'altra: si scoprono i fossili e le specie estinte di un lontano passato. Ciò è ovviamente un problema per la perfezione e l'immutabilità del creato. A cogliere l'importanza della nuova prospettiva in campo naturalistico sono anzitutto Benoit de Maillet e Pierre Louis Moreau de Maupertuis. Nella seconda metà del Settecento il barone d'Holbach ipotizza che nemmeno l'uomo sfugga alla legge della trasformazione naturale.

Il quinto capitolo riprende il dibattito tra creazionisti ed evoluzionisti nella Francia postnapoleonica, in particolare tra Georges Cuvier e Lamarck. Le scoperte di questi naturalisti s'intrecciano con la storia della Francia, di Napoleone e della Restaurazione. Lamarck si rende conto che la vita sulla Terra ha una *storia* e questo lo rende, paradossalmente, il primo vero biologo: la sua teoria è chiamata *trasformismo*. Poiché l'ambiente naturale muta col tempo e poiché le specie dei viventi tendono a rimanere in equilibrio col proprio ambiente, è necessario ammettere la loro variabilità. Cuvier, luterano profondamente religioso, non è d'accordo e perora la causa del creazionismo fissista. Lamarck ribatte con un immenso albero genealogico di tutti i viventi con una valenza non solo statica ma anche e soprattutto dinamica, cioè dotato di profondità temporale. Su queste basi elabora la celeberrima teoria della *ereditarietà dei caratteri acquisiti*, che tuttavia non viene davvero ideata da Lamarck ma piuttosto da lui ordinata e resa coerente. Il tratto essenziale della teoria è che il singolo organismo diventa protagonista della propria trasformazione, artefice di se stesso, attore dell'evoluzione dei propri organi e delle loro funzioni.

Cartesio aveva creato un problema alle scienze naturali negando agli animali l'anima sensitiva ipotizzata da Aristotele e dalla Scolastica (e perciò negando anche l'anima vegetativa) e sostenendo la mera meccanicità di tutti i viventi a eccezione dell'uomo. Nei due secoli successivi i naturalisti hanno dovuto fare i conti, da un lato, con un mondo naturale che, stando a Cartesio, è più morto che vivo (essendo privo di anime) e, dall'altro, con un'anima razionale (il *cogito*) che è senz'altro viva ma al tempo stesso sempre più spiegabile con termini e caratteristiche degli *altri* viventi (non del tutto vivi). Lamarck ritiene, infatti, che anche la psiche umana, la sua anima razionale, sia spiegabile meccanicisticamente: tale conclusione è assai

rilevante perché accomuna tra loro tutti i viventi, uomo compreso. Il risultato rivoluzionario è che i viventi non sono ordinabili in una gerarchia di perfezione, semplicemente perché questa gerarchia non sussiste. Nella lotta scientifica tra Lamarck e Cuvier vince però quest'ultimo, non perché elabora una teoria migliore, ma perché sfrutta contatti politici e potere accademico. Morti Lamarck e Cuvier, il *mobbing* accademico contro l'evoluzionismo prosegue in Francia con i cuvieriani, ben oltre la metà dell'Ottocento. Di fronte ai dati sempre più incontrovertibili a sostegno dell'evoluzionismo viene presentata la tesi antagonista del *catastrofismo*: ci sarebbero state sinora 27 catastrofi e 27 creazioni. Spesso i catastrofisti sono teologi e uomini di chiesa, i quali dimostrano di voler ostacolare l'evoluzionismo per partito preso più che per ragioni dottrinali, poiché è evidente che 27 creazioni sono incompatibili con la Scrittura.

Il sesto capitolo si occupa finalmente dell'evoluzionismo in Gran Bretagna, da Erasmus Darwin a suo nipote Charles. Quest'ultimo completa gli studi teologici ed è in attesa di prendere gli ordini religiosi, quando, com'è noto, ha la possibilità d'imbarcarsi sul famoso *Beagle* alla volta dell'America meridionale, per una spedizione esplorativa di cinque anni. Ne scaturisce il celebre *Viaggio di un naturalista intorno al mondo*. Durante il viaggio Darwin legge e commenta i *Principi di geologia* di Charles Lyell, secondo il quale le forze che plasmano il mondo sono da sempre le stesse: esse agiscono gradualmente e costantemente su tempi lunghissimi. Darwin si convince che una cosa del genere valga anche in biologia nel campo dell'evoluzione naturale. In qualche modo, la tesi geologiche preparano quelle biologiche. Per Darwin il creazionismo è irrispettoso di Dio: non ha senso immaginare che Dio si sia scomodato per le infinite varietà di specie riscontrate da Darwin nel suo viaggio, e addirittura per ben 27 creazioni! Oltre a Lyell, sull'evoluzionismo di Darwin, non possono non pensare le conclusioni della *Storia naturale* di Lamarck e quelle della *Zoonomia* del nonno. In realtà, però, il presupposto teorico più influente risale al *Saggio sul principio della popolazione* di Thomas Malthus: l'economia liberista e il pessimismo malthusiano circa lo squilibrio tra popolazione e mezzi di sussistenza sono elementi chiave dell'evoluzionismo darwiniano. Un altro punto essenziale deriva dalle tecniche degli allevatori di bestiame adottate per selezionare le razze più profittevoli. Unendo Malthus e allevatori si ha la teoria della *selezione naturale*, elemento cardine dell'evoluzionismo darwiniano. Il punto più debole della teoria complessiva è la (non) individuazione dell'origine della variabilità: perché gli individui all'interno delle specie sono relativamente diversi? Darwin decide di ritardare la pubblicazione di un libro interamente dedicato all'evoluzionismo e alla selezione naturale, nonostante dal 1844 abbia quaderni di appunti per un'opera quasi conclusa. Invece chiude tutto in un cassetto in attesa di tempi

più propizi. Nel 1852 il filosofo Herbert Spencer suggerisce una teoria evolutiva basata sulla sopravvivenza del più adatto, nel 1858 il naturalista Alfred Wallace espone una teoria sulla selezione naturale. Darwin capisce che non può perdere altro tempo, così nel 1859 esce *L'origine delle specie*. Omodeo sottolinea come la teoria della selezione naturale abbia fin da subito una ricaduta politica, per esempio nel dibattito dell'epoca tra schiavismo e antischiavismo in un contesto razzista. In ogni caso l'evoluzionismo darwiniano ha un successo straordinario tra i contemporanei, un successo mai arriso né all'evoluzionismo illuministico, giudicato empio e materialistico, né all'evoluzionismo giacobino di Lamarck, affossato dalle lobby accademiche francesi. Quello darwiniano è, a differenza degli evoluzionismi precedenti, in sintonia col suo tempo, fiducioso nel progresso e nella concorrenza tra gli individui.

Dopo Darwin le cose s'intorbidano e si complicano per tutta una serie di ragioni che si possono – anche se non in maniera esaustiva – riassumere così: la tendenza a traslare il darwinismo nel darwinismo *sociale*, con risvolti geopolitici e bellicistici; le critiche politiche provenienti, tra gli altri, dall'anarchico Kropotkin e dalla sua teoria antidarwiniana del mutuo appoggio; non ultimo l'ostile anacronismo di bigotti negatori delle scienze ("è intollerabile che l'uomo discenda dalla scimmia!"). Di ciò tratta l'ultimo capitolo, con due aggiunte importanti: (a) la scoperta della *genetica* che, grazie a Thomas Hunt Morgan, colma il vuoto sull'origine della variabilità lasciato dalla seleziona naturale, e (b) il passaggio all'*evoluzionismo integrale* di Theodosius Dobzhansky. A mo' di epilogo, Omodeo sottolinea che la storia dell'evoluzionismo e la storia che l'evoluzionismo racconta sono tutt'altro che concluse.

Tommaso Scappini

Shaun Gallagher, *The Self and its Disorders*, Oxford University Press, 2023, pp. 368

Con *The Self and its Disorders*, Shaun Gallagher presenta una concezione del sistema umano che rispetta l'assunto di fondo per cui "i sé sono più nel mondo che nel cervello e più come soggetti che come oggetti"[1] (come aveva già detto in un precedente lavoro del 2011 con Vogeley, *The self in the brain*).

In quest'opera viene presentata una teoria secondo la quale l'essere umano è una *gestalt* dinamica. L'intento è quello di contribuire ad arricchire la difficile *arte* della diagnosi psichiatrica, che Gallagher stesso aggiorna tramite un'analisi serrata della fenomenologia di vari disturbi, tenendo in conto an-

[1] Le citazioni in italiano riportate nel testo sono traduzioni mie dall'originale.

che gli avanzamenti in ambito neuro-scientifico. Puntando all'accuratezza e al dettaglio del vissuto in prima persona, inoltre, la teoria di Gallagher ambisce a preservare (e incentivare) la qualità della relazione paziente-terapeuta, considerando un dato fondamentale di partenza, ovvero che è impossibile scindere la malattia, così come la cura, dal contesto sociale in cui l'individuo è inserito e che esperisce quotidianamente.

L'ipotesi di fondo di Gallagher è che i disturbi psichiatrici siano disturbi del sé, laddove il sé rimanda a un sistema dinamico, eterogeneo e complesso che include un'ampia varietà di processi: corporei, esperienziali, affettivi, comportamentali, agentivi, sociali, cognitivi, riflessivi, narrativi, ecologici e normativi. Quella che viene offerta è così una teoria di *Self-patterns* o modelli del sé, i quali possono essere visti come fattori variabili organizzati in un certo "modello ecologico, interpersonale, concettuale, esteso e privato, che è il sé con le sue possibili variazioni" (p. 6). Così facendo Gallagher fa esplicito appello a una prospettiva interdisciplinare che invita, o sarebbe meglio dire che *impone* il superamento del problema dell'unitarietà nella nosografia.

La complessità del sé, infatti, pertiene di più a "materie di studio come l'ermeneutica e la filosofia della scienza" (p. 7) che non a una nosografia generale e unica. Occorre pertanto concentrarsi sull'individuo e sulla sua esperienza soggettiva, e riconoscere da subito che un sintomo è qualcosa che va interpretato, un segno che indica una serie di processi (in qualche modo) disturbati che necessitano di essere approfonditi all'interno di una relazione terapeutica. Allo stato attuale, secondo Gallagher (e invero secondo molti altri filosofi e psichiatri), i sistemi classificatori in uso in ambito clinico-diagnostico sono approssimativi perché, per esempio, non spiegano come mai talvolta un sintomo possa essere presente in più diagnosi senza che per questo si debba parlare di comorbilità.

Quel che offre Gallagher – vale la pena sottolinearlo subito – non è però una nuova classificazione, ma un'originale impostazione del problema su come pensare i disturbi mentali, che affonda le radici nella fenomenologia psichiatrica. L'autore spinge verso una più accurata e attenta osservazione dell'individuo, attraverso la valorizzazione di un approccio fenomenologico che punta sull'ascolto dell'esperienza vissuta in prima persona dalla paziente, alla sua storia personale, compresi i suoi sentimenti e i suoi valori, perché – sempre secondo l'approccio fenomenologico – è la paziente la protagonista e la miglior alleata possibile nella cura di sé. Chiaramente, tale approccio ha profonde conseguenze sia di carattere filosofico (nelle definizioni di malattia, disagio, cura), sia nella gestione e nel trattamento dei pazienti, come – dopotutto – la storia della fenomenologia psichiatrica ci insegna. Si veda ad esempio il significato che assumono i *sintomi*: anche quando ripresentati in terza persona, essi andrebbero concepiti non come avulsi dal contesto e

reificabili, ma letti quali elementi essenziali della vita della paziente, perché di fatto concernono *come* è la sua vita in quel dato momento, e dovrebbero perciò servire ad arricchire la diagnosi, anziché ridurla per semplificare parte del lavoro terapeutico. Alla luce di ciò, il terapeuta dovrebbe riconoscere che la paziente, quando elenca i suoi sintomi, non sta facendo una vera elencazione di manifestazioni dirette del disturbo provato; piuttosto è impegnata nel tracciare una mappa di esperienze interrelate fra loro riguardanti credenze, azioni e interazioni sociali che costituiscono la sua vita. In altre parole, tutto ciò che riguarda la paziente è inevitabilmente intriso delle sue disposizioni incarnate, delle sue abitudini e dei suoi dettagli biografici, per cui – e sembrerà un'ovvietà ma nella pratica clinica non è affatto scontato – una volta calati nella prassi terapeutica, la paziente è più della somma dei suoi sintomi.

La teoria di Gallagher, ponendo un'intima correlazione tra malattie mentali e disturbi del sé (inteso nel senso ampio e inclusivo che abbiamo sopra descritto), prevede il ripensamento della mente alla luce della teoria dell'enattivismo. Secondo questa prospettiva, ogni individuo è definibile da quattro '*e*', che stanno per: *embodied*, *embedded*, *extended* ed *enactive*, e che possiamo tradurre così: *incarnati*, *incorporati*, *estesi* ed *enattivi*. La persona va intesa in senso globale, come ancorata a un corpo vivo, quale sistema che coinvolge cervello-corpo-ambiente. Fra le dinamiche che la caratterizzano vi sono: "processi corporei, che ne includono di autopoietici e bio-sistemici connessi alla funzione motoria, autonoma, endocrina, enterica, immunitaria ed enterocettiva, consentendo al sistema intero di mantenere l'omeostasi necessaria per la sopravvivenza e di distinguere il sé dal non-sé"; "processi preriflessivi esperienziali, inclusa l'auto-consapevolezza preriflessiva, un aspetto strutturale della consapevolezza in prima-persona vincolata da fattori corporei; il senso di meità e il senso di agentività, che possono coinvolgere diverse modalità senso-motorie, come la propriocezione, la cinestesia, il tatto e la vista […], aspetti [che] formano un nucleo esperienziale di ciò che è anche detto *sé minimo* (*minimal self*)"; "processi affettivi [consistenti nel fatto che] un certo temperamento o disposizione emotiva può riflettere un particolare insieme di fattori affettivi che, partendo dall'essere davvero basilari e principalmente impliciti […], possono arrivare a formare un modello emotivo tipico, una serie di sentimenti esistenziali, uno stato d'animo di fondo" (p. 19).

Dall'ampia analisi di Gallagher emerge un modello del sé integrato i cui diversi fattori interagiscono dinamicamente fra loro (come già aveva avanzato Kelso nel suo contributo risalente al 1995, *Dynamic patterns*) influenzandosi vicendevolmente così che, se un fattore o fenomeno muta oltre un certo grado, allora anche gli altri cambiano adattandosi alla nuova disposizione. In tal modo, il modello globalmente inteso mantiene una certa continuità in un persistente rapporto che va al di là del sistema situato cervello-corpo-ambiente, andando a

interagire diacronicamente anche coi processi esperienziali vissuti dal soggetto. Come i vari fattori che concorrono a formare il sé siano dinamicamente connessi fra loro, Gallagher lo spiega ricorrendo a nuove geometrie relazionali che prevedono un'architettura a maglie, una concezione interventista della causalità e un'organizzazione autopoietica. Vediamole nel dettaglio:

1) I processi esperienziali sarebbero intrecciati fra loro in un'architettura a maglie (come anche suggerito da Christensen, Sutton e McElwain nel loro saggio del 2016, *Cognition in skilled action: Meshed control and the varieties of skill experience*); una siffatta architettura coglierebbe meglio la struttura della relazione sé-mondo con un approccio enattivo, che vede la coscienza come incarnata, situata e relazionale, nonché caratterizzata da un'affettività che si sviluppa lungo un'asse orizzontale comprendente processi ambientali, sociali, culturali e normativi.
2) Secondo la concezione interventista della causalità, i vari elementi di un certo tipo sono dinamicamente collegati a quelli di un altro, grazie a un rapporto di causalità definita come trasformativa, non-lineare e interattiva, che va oltre il legame cervello-corpo-ambiente; sarebbe proprio questa interconnessione a far comunicare i processi fisiologici con quelli esperienziali (e su questo punto si veda Krickel, che nel 2018 pubblicò *Saving the mutual manipulability account of constitutive relevance*).
3) Infine, i processi esperienziali coordinati fra loro, vanno intesi come una *gestalt* dinamica e olistica, ovvero un'organizzazione autopoietica operativamente chiusa, ma sensibile al contesto (e stavolta il riferimento non può non andare all'ormai classico contributo di Varela – risalente al 1997 – *Patterns of Life: Intertwining Identity and Cognition*).

Fra i vari fattori che concorrono a formare il sé, l'aspetto neurofisiologico è, quindi, soltanto una parte, un aspetto parziale dell'essere umano, forse – secondo Gallagher – neanche quello più significativo, anche se irrinunciabile. Per mostrare come siano concretamente in relazione fra loro i diversi fattori del *self-patterns*, Gallagher svolge un'indagine avvalendosi di studi clinici ed empirici percorrendo tre strade diverse: una narrativa, una psicopatologica e una neurofisiologica. Narrativa, perché tramite i processi auto-narrativi si svelano le relazioni compositive del sé. La strada psicopatologica è necessaria perché attraverso di essa è possibile differenziare di più e meglio i sintomi – si pensi alla specificazione di un deficit sociale quale mancata distinzione sé-altri nella schizofrenia. La strada neurofisiologica a sua volta è irrinunciabile, perché certi mutamenti fisiologici ne indicano di speculari in un modello composito del sé.

Ciò che qui preme sottolineare è che, attraverso l'indagine psicopatologica, Gallagher illustra ciò che viene sistematicamente omesso dal DSM. Sappiamo, grazie alle interviste in prima persona di pazienti con depressione, che nell'ambito di processi sociali e intersoggettivi, può capitare di "sentirsi come un far-

dello per gli altri, come un perdente", "sentirsi esclusi – non sentirsi coinvolti –", provare un senso di profonda alienazione, avere la "preoccupazione che gli altri pensino che si sia dei simulatori", "sentirsi invisibili", "avere fatto esperienza di maltrattamento" (p. 109). Altri due esempi di processi che non trovano collocazione nel DSM, sempre in soggetti con depressione, sono di tipo narrativo ed ecologico/situato/normativo. Nella prima tipologia sono inclusi: "la formulazione ripetuta di conversazioni che vengono considerate insoddisfacenti"; "l'uso predominante dei pronomi in prima persona"; "narrazioni sul passato descritte in termini di perdita, fallimento e danno"; "narrazioni sul presente che suscitano scarso o nessun interesse"; "narrazioni sul futuro in via di estinzione". Nella seconda invece si trovano: "perdita del senso di salienza personale delle cose (assenza di cura per privazione o danno)"; "scomparsa del senso di appartenenza"; "diminuiti coinvolgimento, gioia e orgoglio" (p. 109). La dovizia descrittiva di questi aspetti intersoggettivi, narrativi ed ecologici, è parimenti (se non più) importante rispetto a tutti gli altri sintomi che hanno trovato posto all'interno del DSM.

Attraverso l'indagine narrativa, invece, viene mostrato quante affinità un *self-patterns* e le competenze narrative abbiano fra loro. La competenza narrativa, infatti, consiste nella capacità di comprendere e produrre storie, costruire riflessivamente, fornire un resoconto narrativo sulle nostre e altrui vite, compreso ciò che ci aspettiamo dagli altri e ciò che gli altri possono aspettarsi da noi. In tutto questo, l'affetto ha un ruolo primario perché ciò che è narrato avrà un significato personale. Anche gli altri, in una narrazione, acquisiscono la dignità di persone, svelando una certa caratura morale, l'assunzione o meno di una responsabilità nelle scelte. Anche per questa ragione, *one is never the sole narrator of one's story* (p. 128), non si è mai i soli e indiscussi narratori della propria storia. Inoltre, l'unità narrativa non è assicurata dalla totalità degli eventi, vale a dire che a preservare dalla dispersione di senso e significato è anche l'incompletezza.

Quello che, secondo Gallagher, permette di formarsi un resoconto narrativo di sé è una certa "distanza narrativa", che può essere declinata in vari modi: "prospettica", minore se la narrazione è fatta in prima persona; "valutativo/affettiva", che riflette quel che si prova rispetto alle proprie esperienze vissute; "temporale", dato che è imprescindibile uno scarto tra il presente del narratore e il tempo narrato; ed "ermeneutica", dovuta all'inevitabile selezione e interpretazione di ciò che va narrato. Quel che si manifesta, per esempio, nel disturbo borderline di personalità (BPD) è una certa frammentazione che interferisce con l'abilità di mantenere una distanza narrativa, quello scarto indispensabile a percepirsi come il soggetto che vive e trascende le esperienze di cui è protagonista. Nella fenomenologia del soggetto con BPD, i confini tra sé e non-sé sono sfumati e il soggetto è alienato dall'esperienza corporea di sé,

una "condizione concomitante dell'instabilità nell'identità riflessiva", nell'affettività e nella sfera interpersonale, che causa ricorrenti sentimenti di vuoto e una spiazzante incoerenza rispetto ai propri scopi, desideri e valori (p. 151). In casi come questo, il *self-patterns* proposto da Gallagher può mostrare in che modo i processi corporei, preriflessivi, affettivi e così via, siano strutturalmente interconnessi fra loro, integrando le parti di una fenomenologia che è altamente complessa. In tale senso, i diversi modelli del sé possono fornire uno strumento prezioso, sia per l'individuazione di una diagnosi più ricca, sia per quella di una terapia più efficace, ma anche per comprendere a fondo che i disturbi mentali sono condizioni di cui il paziente *soffre*.

Quello che Gallagher suggerisce è che questa teoria del sé non fa solo comprendere le ricche opportunità che offre un approccio fenomenologico più rispettoso della sensibilità di ciascuna paziente, ma anche che è possibile tracciare, per filo e per segno, l'itinerario degli effetti di un qualsiasi intervento sull'individuo, per valutarne l'efficacia. Se, per esempio, consideriamo l'isolamento come uno strumento valido di rieducazione nelle carceri, attraverso questo tipo di indagine si scoprirà che gli effetti auspicati non sono quelli raggiunti. L'isolamento infatti comporta non tanto la rieducazione, quanto invece segnali analoghi a quelli riscontrati fra le vittime di tortura, come dissociazione e derealizzazione.

Per concludere, Gallagher considera i casi in cui sono state le pratiche violente delle istituzioni a portare alla malattia e al trauma. Quando, per esempio, il proprio corpo viene sottoposto a tortura, si trasforma da mediatore del proprio coinvolgimento enattivo col mondo, a nemico delle proprie intenzioni. Il trapasso del confine dal corpo come soggetto al corpo come oggetto si traduce in un *io non posso* che soppianta interamente l'*io posso*. Nei campi di concentramento della seconda guerra mondiale, ciò di cui tutte le vittime fecero esperienza fu l'inappartenenza del proprio corpo, la perdita di una dimensione soggettiva dell'incarnazione (p. 241). La consapevolezza minima esperienziale e l'abilità motoria si trasformarono in termini negativi, per cui tutto e tutti, compreso (o per meglio dire a partire da) il proprio corpo, erano esperiti come predisposti alla meccanica produzione di sofferenza (p. 243), come designati a infliggere dolore. A tale riguardo, Kertész, nel suo libro di memorie *Sorstalanság* (*Essere senza destino*) del 1975, ha parlato di "essere in guerra contro" se stessi. L'opera di Gallagher fa tesoro anche della lezione del fenomenologo e filosofo francese (di origine lituana) Emmanuel Lévinas, secondo il quale il volto dell'altro trascende l'ordine delle cose, delle manipolabili e usuali *res*. Il volto dell'altro ci chiama a interrogarci e a rispondergli nel rispetto della sua persona, nel cauto, premuroso e accorto riguardo verso l'altro, *per* l'altro e Gallagher qui reinterpreta la valenza del mondo dell'altro quale rispecchiamento del nostro stesso volto.

Veronica Caselli

Davide Serpico, *L'intelligenza tra natura e cultura*, Rosenberg & Sellier, Torino 2022, pp. 145.

Il libro considera il tema dell'intelligenza con riferimento, in particolare, alle questioni della sua misurazione (cap. 1), definizione (cap. 2) e del peso relativo che cultura, natura e ambiente vi esercitano (capp. 3 e 4). Completano il testo un utile glossario e un'ampia bibliografia che da sola basta a dare un'idea della solidità su cui poggia la ricerca. Al fine di dare al lettore l'informazione più ampia possibile, l'autore dichiara già dall'introduzione di voler mantenere una posizione imparziale rispetto a quelle presenti in letteratura. Pur avendo anche uno spiccato carattere informativo, che rende la lettura fruibile anche per un lettore non specialista, il libro ha lo scopo di presentare i risultati di un'ampia indagine su temi che, allo stato dell'arte, sono così controversi da rendere azzardato assumere una posizione netta (si pensi dal fatto che dell'intelligenza, per esempio, sono state date ben settanta definizioni differenti). Il testo dunque procede cercando, in primo luogo, di far chiarezza sui concetti coinvolti per poi allinearsi con cautela con quello che oggi sembra essere il paradigma emergente in ambiti disciplinari diversi (psicometria, psicologia cognitiva, neuroscienze, biologia), un paradigma che si presenta come il più consapevole sia della complessità delle realtà volta a volta oggetto di studio, sia di come si è andato articolando il dibattito epistemologico contemporaneo. Si tratta, infatti, di assumere una posizione pluralista riguardo ai possibili modelli di spiegazione dell'intelligenza anche, per citare un ambito di ricerca confinante con quello esplorato dal libro, in filosofia della mente (per es. in relazione al problema della causalità mentale). Dalla letteratura esaminata dall'autore risulta con chiarezza come la ricerca di un unico fattore per determinare l'intelligenza, benché ancora praticata, costituisca un approccio parziale quando non addirittura fuorviante. Sulla scorta della nozione wittgensteiniana di "somiglianze di famiglia", Serpico mostra invece che "il concetto di intelligenza coinvolge una costellazione di elementi distinti, seppur interconnessi" (p. 8).

La questione centrale del libro è quella della definizione dell'intelligenza, affrontare la quale, sottolinea Serpico, dovrebbe essere operazione preliminare rispetto alla sua misurazione, seppur storicamente le cose siano andate in modo alquanto diverso "il rapporto tra teoria e misurazione in psicometria presenta numerose ambiguità. Ciò è sicuramente dovuto al fatto che, storicamente, i tentativi di misurare l'intelligenza abbiano preceduto quelli di fornirne una definizione accurata" (p. 37). Che cosa misura in realtà il QI? O per dirla in altri termini, i test misurano o definiscono l'intelligenza? Come si può definire e misurare qualcosa di cui non abbiamo una teoria? I test per la misura dell'intelligenza sono stati elaborati – e questo è un punto centrale

– prima e in assenza di una teoria o anche solo di una definizione condivisa di intelligenza.

> Sebbene i primi ideatori di test avessero idee anche piuttosto specifiche rispetto a cosa volesse dire essere intelligenti, i loro lavori erano caratterizzati da una dimensione fortemente pragmatica, legata perlopiù a obiettivi pratici come la valutazione scolastica e la diagnosi clinica. Di conseguenza, lo sviluppo di teorie che definissero la natura e le caratteristiche dell'intelligenza era secondario (p. 15).

Le prime scale psicometriche di intelligenza sono state elaborate facendo leva sulle intuizioni personali dei loro autori e non di rado derivate dal senso comune, che – come è noto – è un modo discutibile, seppur frequente, di fare scienza. La ricerca di un fattore unico per determinare l'intelligenza è stata poi la peculiarità della proposta teorica di Charles Spearman avanzata nei primi anni del Novecento. Secondo Spearman esisterebbe una precisa caratteristica mentale rappresentativa del comportamento intelligente, il fattore generale dell'intelligenza, o fattore g: tutti gli aspetti dell'attività intellettiva – linguistici, matematici, logici o altro –condividerebbero quindi una funzione fondamentale. Poiché nella visione di Spearman il fattore g rappresenta ciò che accomuna le prestazioni intellettive in domini cognitivi diversi, quella di Spearman è una concezione generalista dell'intelligenza. Sulla natura del fattore g, tuttavia, cominciò ben presto un ampio dibattito, tuttora aperto, che ha diviso gli studiosi fra coloro che sostengono trattarsi di una proprietà "reale" del cervello e altri che invece difendono teorie "multifattoriali" dell'intelligenza, fino a tentare un accordo con il "comune sentire" nel considerare aspetti come, per esempio, l'empatia, la creatività e il senso pratico (p. 45).

L'ipotesi di Spearman circa l'esistenza del fattore g era legata al metodo dell'analisi fattoriale da lui stesso elaborato e ancora oggi ampiamente utilizzato nelle scienze sociali. Spearman ipotizzò che, se le variabili risultanti dall'analisi statistica sono correlate in modo significativo, come nel caso delle varie prove in un test d'intelligenza, allora esse sono riconducibili a un fattore comune (variabile latente), nel caso specifico al fattore g, appunto. Le tesi di Spearman restano ancora oggi esemplari nell'indicare i due problemi fondamentali della psicometria (p. 29) sui quali, il dibattito è ancora in corso: quello relativo all'identificazione dell'intelligenza con una sola o più di una facoltà della mente (problema della generalità) e quello di stabilire quale sia il reale correlato fisico di tale o tali facoltà che determinano i comportamenti intelligenti (problema del realismo). Infatti Spearman ipotizzava non solo che il fattore g fosse un fattore unico ma anche che fosse un qualche genere di energia mentale.

Insomma, se da un punto di vista statistico, il fattore g è utile (e questo apre a una prospettiva pragmatica della psicometria) perché rende conto di una parte significativa della varianza nei test di intelligenza, i problemi sorgono "da un punto di vista psicologico" nella misura in cui non è affatto chiaro

a cosa esso possa riferirsi (p. 47). La questione fondamentale della psicometria, come afferma Serpico, è la seguente:

> [S]pesso non abbiamo un'idea chiara di cosa sia il fenomeno che vogliamo valutare e nemmeno se esso esista per davvero. Per esempio, potremmo voler valutare le differenze individuali nel comportamento narcisista ma non essere certi che esso sia un tratto psicologico o cerebrale ben preciso (p. 29).

Fra coloro che si opposero alla concezione generalista dell'intelligenza, Serpico menziona Godfrey H. Thomson, il quale fu tra i primi a sostenere che l'intelligenza consista di molte capacità intellettive diverse e operanti in modo simultaneo, e Louis L. Thurstone, unanimemente ritenuto il principale critico dell'esistenza del fattore g, che elaborò la prima teoria multifattoriale dell'intelligenza. Esistono quindi due possibili modi di interpretare le teorie psicometriche dell'intelligenza: l'uno realista e l'altro strumentalista. Il problema è se l'analisi fattoriale "rappresenti uno strumento adatto a formulare o confermare teorie psicologiche di tipo descrittivo su come la mente funzioni oppure se possa solo riorganizzare i dati disponibili secondo certe dimensioni interpretative" (p. 52). "Ma esiste un modo per interpretare i fattori dell'intelligenza in senso ontologico? È possibile verificare se il fattore g sia davvero una sorta di energia o abilità mentale generale come riteneva Spearman?", si chiede Serpico (p. 55).

Sembra difficile decidere la questione rimanendo nell'ambito della ricerca psicometrica, perché questa indirizza inevitabilmente verso una visione strumentalista; ciò che è necessario (ed è anche ciò che ha pervaso lo studio dell'intelligenza negli ultimi decenni) è invece il confronto con i dati delle neuroscienze e della biologia (p. 54). Adottare un approccio pragmatista è la posizione ontologicamente meno impegnativa e tale sembra infatti essere quello presente in gran parte della psicologia: esemplare la dichiarazione di Hans Eysenck, riportata da Serpico, il quale scrive – "ironizzando, ma solo a metà" – che quando

> si chiede agli psicologi che cos'è l'intelligenza, essi rispondono talvolta […] che è quella cosa che viene misurata dai test […]. Nella scienza […] le definizioni di questo tipo […] sono molto comuni […]. Si definisce un concetto nei termini dei modi nei quali lo si può misurare, e delle misurazioni ottenute […] Al contrario, in ottica realista, definire un costrutto richiede un confronto più diretto con *come il mondo è fatto*. In questo senso le posizioni realiste sono più connotate da un punto di vista ontologico e richiedono l'utilizzo di nozioni come quella di *causalità e riferimento* (pp. 40-41). [corsivi nel testo originale]

Nella questione dell'analisi fattoriale si nasconde, dunque, il problema del realismo riguardo al riferimento delle entità (teoriche) che vengono impiegate nelle formulazioni dei costrutti delle singole teorie: in modo analogo emergono con chiarezza nel libro questioni generali di tipo epistemologico. Nel

fare il punto sullo stato dell'arte del dibattito sulla psicometria dell'intelligenza è inevitabile che vengano evocati anche temi classici della filosofia della scienza, come il rapporto fra costrutti teorici e dati osservativi (in particolare quando i dati sono di tipo statistico), l'opposizione fra realismo ("secondo cui i test sono misure dirette (seppur imperfette) di un dato costrutto teorico") (p. 36) e strumentalismo (per il quale "è possibile sviluppare strumenti di misurazione di un costrutto senza assumere una posizione definita sulla sua esistenza "reale" o concreta", *ibid.*), nonché la relazione fra categorizzazione e tassonomia. Nonostante il cambio tematico piuttosto significativo, le stesse questioni si ripresentano nella seconda parte del libro.

Al di là della scansione editoriale in quattro capitoli, la cesura concettuale più marcata del volume si colloca fra i primi due capitoli e quelli seguenti, dove temi di pertinenza della psicologia lasciano spazio a quelli della genetica. Il che comporta porre la domanda su quale sia il rapporto fra i due orizzonti che l'autore affronta ponendo la distinzione fra i concetti di *ereditarietà* e *ereditabilità*. Il primo riguarda la trasmissione del corredo genetico speciespecifico che permette al singolo organismo di sviluppare individualmente le capacità caratteristiche della propria specie. L'ereditabilità invece concerne il ruolo che la genetica gioca nel determinare le differenze fra gli individui. Così, laddove l'ereditarietà ha a che fare con ciò che è comune a tutti gli individui di una certa species (piano filogenetico), l'ereditabilità riguarda ciò che li differenzia (piano ontogenetico). Ma le caratteristiche genotipiche e fenotipiche devono fare i conti anche con contesti ambientali determinati. Ora, il rapporto a tre fra genotipo, fenotipo e ambiente è così complesso che non è possibile identificare rapporti causali genuini e distinguerli dalle mere correlazioni statistiche le quali, infatti, possono anche essere spurie. Come è noto, la correlazione non implica la causazione. Discriminare i due casi richiede un qualche genere di teoria.

Un esperimento mentale ideato nel 1995 da Ned Block chiarisce il punto: immaginiamo una società discriminatoria nei confronti delle persone con i capelli rossi, l'istruzione delle quali venga sistematicamente conculcata. Un'indagine statistica troverà un alto indice di correlazione fra colore dei capelli e capacità cognitive, benché ovviamente non esista fra le due caratteristiche nessuna relazione di causa-effetto. Il punto, però, è che siamo in grado di stabilire questa mancanza di relazione causale perché abbiamo "teorie" abbastanza chiare su quali siano i poteri causali del colore dei capelli agenti sull'apprendimento cognitivo, e in virtù di tali teorie *sappiamo* che non vi è alcuna relazione causale diretta tra le due cose. Ma delle cause dell'intelligenza ne sappiamo ancora poco e, inoltre, la psicometria è sorta ben prima anche di quel poco che oggi ne sappiamo, proprio con lo scopo pragmatico di intervenire nell'insuccesso scolastico o di valutare le capacità delle reclute. Serpico

traccia una storia dettagliata della psicometria e del dibattito attuale, ma nel corso dell'esposizione le questioni teoriche che giacciono dietro la rassegna prendono gradualmente il sopravvento fino alla conclusione: "l'intelligenza risulta irriducibile a singoli aspetti psicologici, cognitivi, emotivi o valoriali, venendo a comprendere molti aspetti declinati individualmente e in modo sensibile al contesto" (p. 128).

A fronte dell'impostazione modulare e dominio-specifica delle capacità cognitive presente nella ricerca da qualche decennio, e nonostante lo scetticismo circa il fatto che le correlazioni trovate dai test psicometrici riescano a identificarlo, l'idea che esista un fattore g, un'intelligenza generale o una capacità cognitiva generale, continua a sopravvivere: le correlazioni statistiche sono spesso trattate come riferentesi a un fattore generale dell'intelligenza.

Sebbene non si tratti di un tema trattato nel libro, possiamo trovare qui un collegamento con dibattiti in Intelligenza Artificiale (IA). Parte della ricerca in questo ambito, legata al filone dell'*Artificial General Intelligence*, cerca una strada per dotare le macchine di intelligenza generale. Eric Horvitz, direttore scientifico della Microsoft, ha dichiarato di cominciare a intravedere nelle reti artificiali "scintille di intelligenza generale": un'affermazione problematica se ancora non abbiamo una definizione ben chiara e univoca (ammesso che abbia senso o sia possibile averla) di cosa significhi "intelligenza". Pena la perdita dell'orientamento, porre questioni come quelle dell'intelligenza richiede di determinare un perimetro in cui muoversi. Perciò, sebbene il tema delle intelligenze non umane, animali e artificiali, non rientri direttamente nel quadro disegnato da Serpico, oltre agli psicologi anche i filosofi della mente, particolarmente se si interessano di IA, troveranno nel libro analisi e considerazioni che possono giovare alla loro ricerca. Volendo tener conto anche del tema delle intelligenze non umane, il libro di Serpico indica quindi la strada per una definizione dell'intelligenza sufficientemente generale ma che pone, al contempo, alcuni vincoli concettuali rilevanti.

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