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A Comparative Review of Selected Articles:

Discrepancies in Gesture Production in Young Children with Autism Spectrum Disorder and Typically Developing Children.

Bachelor's project in Bachelor of English

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**A COMPARATIVE REVIEW OF SELECTED ARTICLES:
DISCREPANCIES IN GESTURE PRODUCTION IN
YOUNG CHILDREN WITH AUTISM SPECTRUM
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CHILDREN.**

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Abstract

A set of four research papers written in the last eight years on gesture production in young children with Autism Spectrum Disorder (ASD) and Typically Developing (TD) children were selected for this study. This study reviews the papers on the differences found in gesture production by different children within approximately the same age range (10-37months). The chosen papers were selected from a wider set of studies based on relevancy to the purpose of this study. The focus of this paper is on the cross-sectional and/or longitudinal outcomes of the studies.

Keywords: gesture production, pointing gestures, typically developing, autism spectrum disorder

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Restriction

This study engaged with a set of ten research papers for background reading and as a means of deeper understanding on the relevant topic(s), before being cut down to four:

- *Perceptual role taking and protodeclarative pointing in autism (Baron-Cohen, 1989).*
- *Gesture Paves the Way for Language Development (Iverson & Golding-Meadow, 2005).*
- *Pointing gestures produced by toddlers from 15 to 30 months: Different functions, hand shapes and laterality patterns (Cochet & Vauclair, 2010).*
- *A Prelinguistic Gestural Universal of Human Communication (Liszkowski, Brown, Callaghan, Takada & Vos, 2011).*
- *Gesture in the developing brain (Dick, Goldin-Meadow & Solodkin, Small, 2012).*
- *Assessing Gestures in Young Children with Autism Spectrum Disorder (Bean Ellawadi & Ellis Weismer, 2013).*
- *Early deictic but not other gestures predict later vocabulary in both typical development and autism (Özçalışkan, Adamson & Dimitrova, 2016).*
- *Modelling gesture use and early language development in autism spectrum disorder (Manwaring, Mead, Swineford & Thurum, 2016).*
- *Examination of the relationship between gestures and vocabulary in children with autism spectrum disorder at different language stages (Ökciün-Akçamuş, Acarlar, Keçeli Kaysili & Alak, 2017).*
- *Do Verbal Children with Autism Comprehend Gesture as Readily as Typically Developing Children? (Dimitrova, Özçalışkan & Adamson, 2017).*

This paper had to cut down on several other relevant quantitative studies with longitudinal / cross-sectional design. The chosen studies were narrowed down to gesture specificity and how gestures are a predictor of language rather than the other papers, where the children were already speaking language fluently and the age of the subjects that the studies were being carried out on. The chosen papers made use of a variety of methods and tools in order to acquire the predicted/unpredicted results.

Introduction

Research is being conducted continuously, however, very little research has been carried out on comprehension of *gesture production* with children having ASD (Mundy et al. 1986). For such studies, the focus is always on the microcosm, rather than the macrocosm. Many of the studies which were provided in relation to *gesture production* in young children with ASD, also tackle vocal production. They seek also the similarities or dissimilarities in *typically developing* children and compare them to children with autism with vocal abilities, and how they correspond to *gesture production*. There are also comparisons to children with DD (developmental delays) as well. Most of the studies are longitudinal studies, and therefore test their subjects over a period of time.

As cited by Nobuo, 2003, various researchers did not agree on pointing and grasping gestures early on in the 60s and 80s, two different gestures which Baron-Cohen, in his 1989 study focuses more in depth.

How do these research papers consider *gesture production* in young children with ASD and TD? What comes first, language or gesture(s)? How do these research papers then differentiate between the produced different gestures, if the children are on the onset of language? And lastly, how important is comprehension of language for the produced gesture to be 'correct' during the studies?

Theory

According to David McNeill's 1992 *Hand and Mind: What Gestures Reveal About Thought*, "gestures are an integral part of language as much as are words, phrases and sentence-gestures and language are one system" (p.2). In Ökcün-Akçmuş, Acarlar, Keçeli Kaysili & Alak's 2017 paper on this subject, they cite Carpenter et al.,1998, Crais, Douglas, & Campell, 2004, that gesture is one of the primary signs of "intentional communication skills". *Gesture production* is a means of communication, not just between a group of people who speak different languages and don't have a lingua franca, but as a natural way of the first language acquisition.

Language acquisition occurs while the foetus is still in the amniotic fluid, and continues developing for a long time after one is born (Karmiloff & Karmiloff-Smith, 2002, p.1). We are therefore exposed to language and sound from before we are born and by the time we are born, we are already on the path to language acquisition. There are different stages in language acquisition and the stage prior to acquisition is just as important. We go from cooing and babbling to *gesture production* to a combination of both and onto speaking eventually. Dick, Goldin-Meadow, Solodkin and Small write in their 2012 article that there still is much to be done to understand the connection between gesture and speech production, especially since we are exposed to co-speech gestures from birth.

In the different resources provided for this paper, one could outline the different types of gestures found as used by TD children and children with ASD, among others, as well as those used by adults. As cited by Cochet & Vauclair in their 2010 article on the different gestures toddlers produced, young children begin communicating through gestures around the end of the

first year. They also write that these communicating gestures are very important in early development of social-cognitive abilities.

This paper partially focuses on children with ASD and how they differ than TD children as they learn language through gesture use. Baron-Cohen (1989), cites Schopler & Mesibov (1987) that “Autism is a neurodevelopmental disorder” and that is defined as having serious difficulties in being able to “relate socially and in communication” (Kanner, 1943).

The main gestures recorded in the studies provided are either pointing of the index finger or open-hand pointing. These however, have different meanings depending on the situation. Bean Ellawadi & Ellis Weismer refer to the production of these gestures as “point, give and show”, while Baron-Cohen refers to the “point and give” gestures as protodeclarative and protoimperative. Other studies simplify this to “deictic” gestures. However, there are also the “representational gestures”, which are divided in two, having the first as the “etiquette” gesture, i.e. waving bye and the other, that is more “object-related” and can be regarded as pantomimes (Capone & McGregor, 2004).

Methodologies

There were various methods used to gather the data in the selected papers.

The setup of the first task in Cochet & Vauclair’s study was the *unimanual grasping task*, where the children had to clench the various balls which were coloured differently and set in front of them by the experimenter. They were then presented with different “pointing tasks”, which was aimed at eliciting imperative, declarative expressive, and declarative informative *pointing gestures* (Tomasello et al., 2007). In the second part, five attractive toys were used to instigate the imperative pointing gesture. This time, the experimenter sits opposite the child and handles the object first, before handing it to the child and takes it back after some seconds and puts it

out-of-reach. This way, the child would point to the toy if interested and would be given the toy back. If on the other hand, the subject showed no interest, the experimenter would try to capture interest in the child by describing the object in a positive way (Cochet & Vauclair, 2010).

The study continues with the declarative expressive task (DE), by creating a “sudden” situation to the child by having the experimenter (E1) and the child sitting opposite each other, and another person (E2) behind the experimenter (E1) who holds up a picture twice and holds it up for a while so as to capture the child’s attention and take it back down, just to get the child to do a pointing gesture towards it (Cochet & Vauclair, 2010). The final study in this research paper was the declarative informative task (DI), a different type of situation is created where one experimenter puts down a common object on the table and leaves the room, while the other experimenter comes in and puts something on top of it and see if the child reacts to it. If there is no reaction then the experimenter would ‘play dumb’ as to where the object is, just so to get the child’s attention (Cochet & Vauclair, 2010).

Liszkowski et al. use a different setup to elicit *gesture production*. They followed a previous setup used by Liszkowski & Tomasello in 2011. The main study is set up in a “museum-like” situation where a room is set up with different pictures and figures on a wall, and the child, accompanied by his/her caregiver, interact together. This study was video recorded, and the data gathered was analysed afterwards by the experimenter, since the experimenter was not in the room during the task. This way, both child and caregiver interact naturally without any distractions or perform less effectively due to the ‘unfamiliar experimenter’.

Bean Ellawadi and Ellis Weismer use various “measurement tools” to assess *gesture production* in children with ASD. The first tool used was the *Autism Diagnostic Observation Schedule* (ADOS), where the main objective is to assess gesture as a factor of social interaction in children with neither “receptive nor expressive language to verbally fluent adults” (2013). By

using ADOS, the child is given a chance to express him/herself better through *gesture production* in the given situation.

The second tool used is the *Early Social Communication Scale* (ESCS), which is based on assessing children with nonverbal social skills that usually appear between 8-30 months of age according to the cited reference by Ellawadi & Weismer. This observational tool however, does not focus on expected and typical behaviours found in children with ASD, but rather TD and DD children (Ellawadi & Weismer, 2013). The gestures elicited from ESCS vary, but are also specific when a task is presented (for example a joint attention, JA, task is expected to be performed, the child would therefore point to the referent as expected).

The *MacArthur-Bates Communicative Development Inventory: Words and Gestures*, CDI-WG, is the third and final method used in this study. It was originally built for children under 1.2 years of age, but has been found to be of good use in children with ASD who are older and also in TD children (Charman et al., 2003; Fenson et al., 2007; Luyster et al., 2008). This tool is a bit different than the previous methods used since it is more parent focused. This tool has more of a “check-list” format and is used to document both verbal and *gesture production* by the caregiver (Ellawadi & Weismer, 2013). They write that the CDI-WG however, classifies all types of *pointing gestures* as one, with the criteria being of having the child do a stroke and use the index finger to point to whatever the situation is (2012). This means that it would be difficult to decipher the meaning of the pointing being done. ADOS refers to joint attention (JA) and behaviour regulation (BR) gestures as *pointing gestures* (Ellawadi & Weismer, 2013). However, the ESCS considers the *pointing gestures* accordingly, either JA or BR, in this case, the function of the gesture is of importance here (ibid).

There are more differences between these methods that Ellawadi and Weismer use in this study with regards to different meaning in gesture, ex. *showing* vs. *giving*. ADOS considers *giving* by the way the hand is formed. The release of an object to another person is a good example of

this, which is similar to the CDI-WG tool (2013). ESCS considers the same gesture as fulfilled, when the child moves the object closer to the examiner (2013). The main difference however, is that the first two tools, ADOS and ESCS are overseen by an examiner, while the latter, the CDI-WG is observed by the child's caregiver (Ellawadi & Weismer, 2013).

The last paper used the Communication Play Protocol (CPP), which was also recorded and had caregiver-child interaction. Although there is some verbal communication involved in this method, hand gestures were involved in the eliciting of response. This test is in some ways similar to that employed by Liszkowski & Tomasello as mentioned earlier. Both body language and hand gestures were coded accordingly by a trained researcher who was not informed of the study's hypothesis, and therefore presents as much an impartial interpretation as can be on the presented material.

Discussion

Cochet, Vauclair – 2010

Hélène Cochet and Jacques Vauclair's study on *pointing gestures* and their functions as produced by toddlers between the age of 15-30 months is the first paper chosen in this review. They were interested in both *imperative* and *declarative* gestures and how they differ, since it is harder to assume potential differences between declarative expressive and declarative informative *pointing gestures* (p.433). Therefore, the aim of this study was to examine the different types of *pointing gestures* and to label their evolution in terms of form, duration, gaze, manual laterality, and vocalisations (p. 437).

In contrast to the other studies, although the task was video-taped, there were three people present in the room; the child, the experimenter, and another behind the camera taking down notes on the child's behaviour.

For this study, a total of 48 children (23 girls and 25 boys) aged between 14.6-31 months from four different day-care centres took part (p. 433). They were tested in separate rooms, away from the rest of the children in the day-care.

Out of the 48 children who participated in this study, 47 of them produced *pointing gestures* (434). Five attempts were carried out for all three pointing situations. However, the children only produced a pointing gesture only in 52% of them (ibid.). The main contrast in the results was between the imperative and declarative expressive gestures and the declarative informative pointing (438). The results proved that imperative and declarative *pointing gestures* occur from different processes (ibid.). As cited by Cochet & Vauclair, imperative pointing emerges from noncommunicative reaching actions, obtaining a communicative function through ontogenetic ritualization as the children understand that their actions have certain on adults (ibid.).

Moreover, the relation between age and type of gesture proofs the hypothesis that imperative and declarative gestures have different origins (ibid.). Also, as the children grew older, they also started using the index finger pointing gesture more often, and therefore using open-hand gestures less frequent (ibid.). Finally, declarative expressive pointing resulted that it was closer to imperative pointing in relation to visual behaviour and hand preference, but closer to declarative informative pointing when it came to vocalisations, hand shape, and gesture duration (439). It was also noted that the declarative expressive gestures were not just produced with the sole “goal other than sharing interest about a surprising event” (ibid.).

They conclude that the pointing gesture is a complex one and that it occurs in a variety of situations. Should any future researchers decide to write about this, they should focus on other various factors “in order to fully investigate and understand this communicative behaviour” (440).

Liszkowski, Brown, Callaghan, Takada & de Vos – 2011

This second chosen paper was interesting in that the same study was carried out in seven different cultures around the world, in order to find *pointing gestures* in preverbal children and their caregivers (p. 698). A characteristic means of human “prelinguistic communication” is the pointing gesture, which happens between 8-12 months of age (p. 699), and this is the aim of this study; to prove that the hand gestures, mainly the pointing gesture, occurs in the same age group by all, regardless of their background.

In this study, the infants were also video-taped. However, they were accompanied by their caregiver (mostly mothers). This differs from the first paper in that the caregiver participated as well, and this could have significant influences in the results, also the diverse “culture” is also a factor here, even though in the first paper, the researchers tried to vary their subjects by going to four different day-cares.

For this particular study, a total of 96 children were tested, with the focus being on the age range 9-15 months, since it is around this time that joint attention behaviour happens according to Carpenter et al., 1998. Unfortunately, a total of six dyads had to be excluded due to either camera malfunctions or the caregiver did not look at the decoration items (p. 701), and therefore the whole point of the task was futile in such cases.

The setup for this study comprised of 20 different stimulus items (Liszkowski & Brown, 2007). There were both pictures of objects found in every-day life and tangible objects, amongst others (ibid.). The set up was hung up on a wall and all the pictures/objects varied from country to country (same concept and setup, using local objects). Although the set-up differed from country to country, the task in England, for example, was the same for all who took in there. The interactions were then recorded and decoded by a trained assistant, using ELAN, an annotation program developed by the Max-Planck-Institute for Psycholinguistics (p. 703-704).

Pointing gestures in infants were found in all the different countries that were part of this study (p. 707). The main idea for this study was to elicit pointing gestures, and since this aids in joint attention, the structure of the method used was ideal for this study. It concluded that there was no influence on infant pointing with regards to culture. However, there was a connection between caregiver and infant pointing, which also held when controlled for infant age (p. 709). Moreover, it was found that neither caregivers nor infants were imitating each other, since the initiated *pointing gestures* were not related (ibid.). There was however, a relation to the number of points and the points that followed (ibid). This study also found that the caregivers were the ones leading the task and the infants were following suit, rather than the other way around (ibid). This was interesting since it held up to the cross-sectional finding by Lock et al., 1990, where the caregivers seem to increase the pointing a bit before the onset of pointing in the infants (ibid.).

Bean Ellawadi & Ellis Weismer – 2013

The aim of this third paper in this review was to understand whether the gestures: *point*, *give* and *show* matched with measurement tools used to determine *gesture production* in children with ASD through joint attention (p. 524). It is known that children with ASD have difficulty in joint attention, and therefore through the use of three different methods, ADOS, ESCS and CDI-WG, measured the reaction (gesture production) between method and gesture produced.

For this study, there were 78 children with ASD, almost nonverbal and with a mean age of 30 months (p. 526). They were all enlisted from various sources (ibid.). After the data was collected, it was sub-divided according to the expressive vocabulary as outlined in the CDI-WG task that was filled in by the caregivers.

The main results of the whole study, showed that none of the measures corresponded to the other (p. 528). The pointing gesture was the main gesture that had the most various occurrences across all three tests (ADOS, CDI-WG, and ESCS BR) (ibid.). While the pointing gesture appeared in connection to ADOS and ESCS, the giving gesture appeared in connection to the CDI-WG and ESCS (p. 529). On the other hand, the showing gesture was the only one of the three gestures that had the most constant definition across all three methods used (ibid.).

According to Bean Ellawadi & Ellis Weismeir's citation, the results are "consistent with previous work" (p. 529) that shows that children's *gesture production* can be affected due to examiner familiarity (ibid.). Moreover, it was resulted that children with ASD are more likely to perform less in the company of an unfamiliar person (ibid.). This is seen in the *showing* gesture. There's also consistency in the finding that children were more likely to produce BR gestures than JA (p. 530).

All of the measurement tools used in this study give an idea of different *gesture production* in children with ASD, and this proves the varied outcome across the three different tests (ibid.). Each of the three measurements used (ADOS, ESCS, and CDI-WG) are more set up to elicit one type of gesture. However, although the aim of this paper was reached, there still remains more research to be done in this field by using different tools in connection to JA and BR.

Özçaliskan, Adamson & Dimitrova – 2016

The final paper engaged with in this review, takes on early deictic gestures as predictors of language (p. 754). It has been found and studied over the years that *gesture production* is a predictor of language (ibid.). This paper on the other hand, looks at the similarities and dissimilarities found in typically developing children and children with ASD (ibid.).

A group of 23 *typically developing* children aged 18 months, and another group of 23 children with ASD, aged 30 months, took part in this study along with their caregivers (ibid.).

The longitudinal study in this paper follows the CPP method in eliciting gestures from the children (p. 756). The idea behind this method is similar to the one Liszkowski et.al use in the second paper mentioned above. This method, made use of a more naturalistic situation in a room, rather than the “museum-like” set-up by the one performed by Liszkowski et al. This was also divided so as to elicit as many gestures from the children as possible. This method elicits five main gestures in this study, namely, deictic gestures, give gestures, conventional gestures, iconic gestures and beats (p. 756-757). In this study however, it resulted that few iconic gestures and none beats were used (p. 757).

As hypothesised, there was a visible gesture discrepancy between the *typically developing* children, and those with ASD (ibis.). However, both groups produced the main four gestures (deictic, give, conventional, and iconic) (p. 758). The children with ASD produced less gestures, however, it was proved that only the deictic gestures predicted vocabulary size in TD and ASD children a year later (p. 760). This, continued to highlight previous work done on both children with ASD and TD children (ibid.). As Özçaliskan, Adamson & Dimitrova cite, the *pointing gestures* is the last stage of communication before the onset of language (speech) (ibid.).

In conclusion, this study brought about new results that shows how children with ASD produce less gestures than TD children, even though they are almost on the same level vocally (ibid.). In addition, both children with ASD, and TD children depend on the same types of gestures (ibid.).

Conclusion

This limited review was interested in looking at the different production of gestures by young children with ASD and TD children. It looked also at the various methods used in the different papers and how the results corresponded to each other (or lack thereof). Lastly, although cognitive theory was not the focus of this study, it does play an important role in language learning and language acquisition and is therefore sometimes undermined.

All four papers had a different research and used different methods to elicit different gestures, however, the results as a whole were quite similar. According to results in Cochet and Vauclair's 2010 paper, imperative and declarative gestures are the result of different processes (p. 438), while in Bean Ellawadi and Ellis Weismer's 2013 paper, the three methods used, elicit three main different gestures, even though *gesture production* might be influenced by a number of other factors (530). In Liszkowski et al., 2011, we have a confirmation that *gesture production* in young children is very similar across countries. Özçaliskan, Adamson & Dimitrova (2016) on the other hand prove that the production of deictic gestures results in language production.

A combination of the four papers show then, how the gestures produced by different groups of children, are acquired differently through different situations and are produced in a similar way 'universally', and that only deictic gestures are the precursor of language. Although all of the papers had satisfactory results, all of them called on more research about the salient topics to be carried out, especially since the field is still quite young, and more methods have yet to be tested.

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