Interaktionen
von Kindern mit und ohne (Hör-)Behinderung
in inklusiven Kindertageseinrichtungen
mit und ohne Gebärden(sprache)

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Inhalt

Abkürzungen

CI	Cochlea-Implantat
DGS	Deutsche Gebärdensprache
DHH	d/Deaf and/or hard of hearing
DLD	Developmental Language Delay/Disorder
Kita	Kindertageseinrichtung
LUG	Lautsprachunterstützende Gebärden
SEND	Special Educational Needs and/or Disabilities
UN	Vereinte Nationen (United Nations)
UN-BRK	UN-Konvention über die Rechte von Menschen mit Behinderungen

Kapitel I

Einleitung

1. Hinführung und Überblick

In den letzten Jahrzehnten wurde in Deutschland das Angebot an Kindertageseinrichtungen (Kitas) insbesondere in den westdeutschen Bundesländern deutlich ausgebaut, sodass diese zu einem wichtigen Entwicklungs- und Sozialisationsumfeld wurden (Kluczniok & Schmidt, 2021). In diesem wurden und werden zunehmend mehr Kinder mit Behinderungen und/oder besonderem Förderbedarf (Special Educational Needs and/or Disabilities, kurz: SEND) gemeinsam mit Kindern ohne SEND betreut, erzogen und gefördert (Wiedebusch & Albers, 2016). Zunächst wurde dies vor allem im Rahmen integrativer Konzepte durchgeführt, bei denen der Fokus darauf lag, dass Kinder mit SEND am allgemeinen Bildungssystem teilhaben können und hierfür gezielt gefördert werden (vgl. diess.). Aus mehreren Strängen jedoch entwickelte sich international und damit zunehmend auch in Deutschland ein Verständnis für die Relevanz von Inklusion – und eng damit verwoben Partizipation – im Bildungssystem (Beck, 2022): So ist zum ersten politisch die Herstellung und Sicherung von Frieden, Grundfreiheiten, Demokratie und menschenwürdigen Bedingungen für alle Menschen ein zentrales Ziel, das über Dokumente wie Menschenrechtskonvention der vereinten Nationen (UN, 1948) und die „World Declaration on Education for All“ (UNESCO, 1990) anvisiert wurde. Zusammenhängend damit rückte mit der Erklärung von Salamanca (1994) Chancengerechtigkeit für alle von Diskriminierung gefährdeten Gruppen in den Blick. Mit der 2009 ratifizierten UN-Behindertenrechtskonvention (UN-BRK bzw. CRPD, UN 2006/2008) schließlich wurde bei allen Vertragsstaaten, darunter Deutschland, ein inklusives Bildungssystem insbesondere auch für Kinder mit Behinderung zum Ziel, in dem Kinder mit Behinderung gleichberechtigt partizipieren, also teilhaben und teilnehmen können, und in dem dafür geeignete Bedingungen geschaffen werden (UN 2006/2008). Auch die UNESCO fordert in ihren „Leitlinien für Bildungspolitik“ ein inklusives Bildungssystem und aufgrund der in der frühen Kindheit weichenstellenden kognitiven Entwicklungsphase „Inklusion durch frühkindliche Bildung sicher[zu]stellen“ (Deutsche UNESCO-Kommission, 2009). Dies geht Hand in Hand mit dem zweiten Strang vorrangig philosophisch, aber auch sozial- und politikwissenschaftlich diskutierter ethischer Fragen zur Verteilung von Zugangschancen, da (frühe) Bildung und Erziehung „Voraussetzung, Bedingung und Teil von Lebenschancen“ ist (Beck, 2022). Daneben kann ein dritter Strang zum

Inklusionsbegriff in der Soziologie ausgemacht werden: Die Systemtheorie nach Talcott Parsons (1969) und in Deutschland Niklas Luhmann (1995) beschäftigt sich mit der Inklusion in und Exklusion aus gesellschaftlichen Teilsystemen und deren Organisationen, wozu auch Kitas gehören. Risiken der Exklusion werden im Rahmen der Ungleichheitsforschung diskutiert – wobei auch innerhalb von Teilsystemen Exklusion möglich ist (Beck 2022).

Innerhalb einer Kita, die in der Systemtheorie als Organisation auf der Mesoebene angesiedelt ist, laufen auch Interaktionen auf der Mikroebene ab. Zahlreiche internationale Studien zeigen, dass Interaktionen in Kitas neben der kognitiven auch die sozial-emotionale und sprachliche Entwicklung von Kindern entscheidend beeinflussen (Broekhuizen et al., 2016; Heckman, 2006; Mashburn et al., 2008; Valiente et al., 2020; Vitiello et al., 2012). Dies gilt nicht nur für Interaktionen mit pädagogischen Fachkräften, sondern gerade auch mit anderen Kindern (Guedes et al., 2020; Kluczniok & Schmidt, 2021; Rubin et al., 2011; Valiente et al., 2020; Vitiello et al., 2012). Bei Peer-Interaktionen und im Spiel mit Gleichaltrigen erwerben und verfeinern Kinder sozial-emotionale, kognitive und sprachliche Kompetenzen wie beispielsweise Zugangsstrategien zu Interaktionen und Fähigkeiten zu ihrer Aufrechterhaltung und Gestaltung (Corsaro, 2013; DeLuzio & Girolametto, 2011). So wirkt sich das positive Eingebundensein in Peer-Interaktionen auch im weiteren Leben auf Bereiche wie das Selbstwertgefühl, die soziale Akzeptanz und die Beziehungsfähigkeit aus (Antia 1994; DeLuzio & Girolametto, 2011; Ladd, 2005). Kinder erwerben bei Peer-Interaktionen insgesamt wichtige Fähigkeiten, um Freundschaften zu schließen und aufrecht zu erhalten (Garvey 1984; Rubin 1980). Zusammenhängend mit diesen Faktoren wird auch das Risiko, im mittleren und späteren Leben an Depressionen zu erkranken, durch Eingebundensein in positive Peer-Interaktionen gesenkt (Jiang & Wang, 2020).

Die Studienlage zu Peer-Interaktionen in Kitas ist im deutschsprachigen Raum jedoch selbst für Kinder ohne SEND bislang dünn (Kluczniok & Schmidt, 2021). Zur Inklusion von Kindern mit SEND in Kitas und insbesondere zu ihrer Partizipation an Peer-Interaktionen liegen noch viel weniger Studien vor (Wiedebusch & Albers, 2016). International betrachtet geht jedoch aus einer Reihe an Studien hervor, dass der Zugang zu Peer-Interaktionen für Kinder mit SEND abhängig von der genauen Diagnose und weiteren Faktoren erschwert oder gefährdet sein kann (Antia et al.,

2012; Guralnick et al., 1996, 2006; Odom et al., 2002, 2004). Als Risikofaktoren wurden neben sozial-emotionalen Entwicklungsauffälligkeiten insbesondere Sprach- und Kommunikationsprobleme identifiziert (Odom et al., 2002). Letztere können aufgrund von Hörbehinderungen, aber auch wegen verschiedener anderer Faktoren entstehen (z.B. Antia et al, 2012; Odom, et al., 2002). Angesichts der großen Bedeutung von Peer-Interaktionen für die Entwicklung von Kindern stellt sich die Frage, inwieweit Kinder mit SEND und insbesondere Kinder mit Hörbehinderungen oder mit aus anderen Gründen begrenztem Zugang zur Lautsprache an diesen gleichberechtigt partizipieren können – und mit welchen Maßnahmen dies möglicherweise unterstützt werden kann (vgl. Wiedebusch & Albers, 2016).

Um zu ihrer Beantwortung beizutragen, wurde in dieser Dissertation die Rolle von Spielaktivitäten sowie das Erlernen und Nutzen von Gebärden als mögliche Förderfaktoren zur Partizipation von Kindern mit SEND an Peer-Interaktionen in inklusiven Kitas untersucht. Hierfür wurden Fragebogen- und Videodaten erhoben und analysiert. Bevor ich die Studien im zweiten Kapitel im Detail vorstelle, werde ich im Folgenden Interaktionen definieren und Ansätze zu ihrer Förderung erläutern. Anschließend werde ich den aktuellen Forschungsstand zu den beiden in dieser Arbeit verfolgten Ansätzen zur Interaktionsförderung für Kinder mit SEND – Spielaktivitäten und Gebärden(sprache) in verschiedenen Kitasettings – zusammenfassend vorstellen.

Insgesamt soll anhand dieses Vorgehens untersucht werden, inwieweit und unter welchen Bedingungen Spielaktivitäten und Gebärden(sprachen) Förderfaktoren zur Teilhabe von Kindern mit SEND darstellen können. Auf Basis des Forschungsstandes in Kapitel I werden die Forschungsfragen formuliert. Diese werden in drei Studien und einem Poster untersucht (Kapitel II). Ihre Ergebnisse werden in Kapitel III zusammenfassend interpretiert, bewertet und diskutiert. In Kapitel IV werden abschließende Folgerungen gezogen sowie weiterhin offene Fragen thematisiert.

2. Interaktionen und ihre Förderung

Als soziale Peer-Interaktionen können alle Interaktionen zwischen zwei oder mehr etwa gleichaltrigen Kindern bezeichnet werden, in denen verbal, nonverbal oder auf beide Arten interagiert wird (vgl. Kim et al., 2003). Es kann also lautsprachlich, gebärdensprachlich, in Mischformen wie lautsprachbegleitendem oder

lautsprachunterstützendem Gebärden (LBG bzw. LUG), nonverbal durch Mimik, Gestik, Blickkontakte, physische Kontakte oder die Übergabe von Objekten kommuniziert werden (vgl. Beckman & Kohl, 1984; Martin et al., 1991; Rettig et al., 1993). Bezüglich der Struktur von Peer-Interaktionen von Kindern im Kitaalter wurden verschiedene Ebenen beobachtet und klassifiziert. Eine häufig genutzte Klassifikation für die kognitiven Levels, auf denen Kinder im Spiel interagieren, stammt von Smilansky (1968). Auf ihrer niedrigsten Stufe „functional play" nutzen Kinder Spielmaterialien vor allem zur Stimulation ihrer Sinne, beim „constructive play" nutzen sie Spielmaterialien, um etwas zu bauen und auf der komplexesten Stufe „dramatic play" nutzen sie Spielmaterialien, um imaginären Spielmotiven nachzugehen. Das Erreichen des komplexesten Levels des Rollenspiels ist insbesondere deshalb wichtig, weil Studien zeigen, dass durch Rollenübernahmen soziale und kooperative Kompetenzen gefördert werden (Kim et al., 2003). Kinder mit SEND jedoch interagieren insgesamt auf niedrigeren Levels und eher mit Kindern ebenfalls mit SEND (diess.).

Wie eingangs erwähnt, zeigen Studien, dass Kinder mit SEND insgesamt gefährdet sind, nicht oder weniger an Peer-Interaktionen in Kitas partizipieren zu können und dass insbesondere geringere sprachliche und sozial-emotionale Kompetenzen hierfür Risikofaktoren darstellen (Guralnick, 1996; Odom et al., 2002). Um die Partizipation an Peer-Interaktionen für Kinder mit SEND zu verbessern, sind an verschiedenen Punkten ansetzende Maßnahmen untersucht worden: So können Fachkräfte für bestimmte Interventionen geschult werden und diese durchführen (*teacher-led*), bei Kindern mit SEND selbst können für Interaktionen notwendige Kompetenzen gefördert werden (*child-specific*), Kinder ohne SEND können für besondere Bedürfnisse von Kindern ihrer Gruppe sensibilisiert und geschult werden (*peer-mediated*) oder es können Umgebungsfaktoren variiert werden (*ecological factors*) (Driscoll & Carter, 2009; Kim et al., 2003; Odom et al., 1993; O'Gorman Hughes & Carter, 2002).

3. Ansätze zur Interaktionsförderung in dieser Arbeit

Im Rahmen dieser Arbeit werden zwei bislang wenig beforschte Ansätze verfolgt, bei denen jedoch die bereits vorliegenden Studien einen Einfluss auf das Interaktionsverhalten von Kindern mit SEND nahelegen: Der ökologische Faktor der

den Kindern im Freispiel angebotenen Spielaktivitäten wird ebenso untersucht wie ein Angebot von Gebärden(sprache) für alle Kinder in inklusiven Kitagruppen. Im Folgenden wird der bisherige Forschungsstand zu diesen beiden Ansätzen vorgestellt.

3.1. Spielkontexte – Forschungsstand

Ökologische Faktoren zur Verbesserung der Teilhabe an Peer-Interaktionen standen bislang kaum im Fokus der Forschung (Heimlich, 2017). Analysen der Beziehung zwischen Aktivitätssettings und Peer-Interaktionen sind sogar noch seltener (Kluczniok & Schmidt, 2021). Dabei gelten gerade Maßnahmen, die ökologische Bedingungen manipulieren, um Interaktionen von Kindern mit und ohne SEND zu verbessern, als einfach zu implementieren und ressourceneffizient; sie benötigen wenig Zeit und Weiterbildung für Fachkräfte (Driscoll & Carter, 2004; Odom et al., 1993). Ein ökologischer Faktor, für den einige Studien in den letzten Jahrzehnten Effekte auf Peer-Interaktionen von Kitakindern gefunden haben, sind Spielzeuge und die damit verbundenen Spielaktivitäten (Ivory & McCollum, 1999; Kim et al., 2003; Martin et al., 1991; Rubin & Howe, 1985; Trawick-Smith et al., 2011). Dabei liegen abhängig vom Setting (international *mainstreamed, integrated/inclusive, segregated* bzw. deutsch Regelkitagruppe, integrative/inklusive Kitagruppe oder Kitagruppe ausschließlich für Kinder mit Behinderung und/oder Förderbedarf), den untersuchten Kindern (mit und/oder ohne SEND) sowie abhängig vom Studiendesign verschiedene Ergebnisse vor.

Die meisten Studien identifizierten jedoch übereinstimmend ähnliche Spielzeuge als „social toys“, mit denen Kinder eher mit anderen Kindern interagieren und als „isolate toys“, mit denen Kinder eher alleine spielen (z.B. Ivory & McCollum, 1999; Kallam & Rettig, 1991; Kim et al., 2003; Rubin, 1977a, 1977b; Trawick-Smith et al., 2011). So wurden vor allem Bälle, Bausteine, Verkleidungen, Haushaltsspielzeug, Puppen und Spielzeugfahrzeuge als „soziale“ Spielzeuge kategorisiert (Ivory & McCollum, 1999; Kallam & Rettig, 1991; Kim et al., 2003). Puzzles, Knete, Bücher und Kunstmaterialien hingegen wurden als „isolierte“ Spielzeuge definiert (Kallam & Rettig, 1991; Kim et al., 2003). Diese Beobachtungen wurden insbesondere zum einen im natürlichen Setting regulärer Kitas für Kinder ohne SEND gemacht und bestätigt (Rubin, 1977a, 1977b; Trawick-Smith et al., 2011) und zum anderen in

experimentellen Studien für Kinder mit SEND in verschiedener Gruppenzusammensetzung (Beckman & Kohl, 1984; Kim et al., 2003; Martin et al., 1991; Ivory & McCollum, 1999).

Abweichende Ergebnisse zeigten sich jedoch sowohl bei der Untersuchung der Interaktionen von Kindern ohne SEND in Gruppen mit Kindern mit SEND als auch bei der Untersuchung von Kindern mit SEND in natürlichen Settings: So bestätigte zwar eine Studie von Beckman und Kohl (1984) übereinstimmend, dass Kinder ohne SEND auch in Gruppen mit Kindern mit SEND beim Angebot sozialer Spielzeuge mehr mit anderen Kindern interagierten. Andere Studien hingegen fanden in integrierten oder inklusiven Settings für Kinder ohne SEND keine signifikanten Effekte von sozialen versus isolierten Spielzeugen auf Interaktionen mit Gleichaltrigen (Kallam & Rettig, 1991; Martin et al., 1991). Ebenso fanden die wenigen und kleineren Studien an Kindern mit SEND im natürlichen Setting integrativer oder inklusiver Kitagruppen keine oder kaum Auswirkungen von sozialen Spielzeugen im Vergleich zu isolierten Spielzeugen auf ihre Peer-Interaktionen (Driscoll & Carter, 2009; O'Gorman Hughes & Carter, 2002). Eine dieser kleinen Studien im natürlichen Setting fand jedoch einen signifikanten Unterschied bezüglich der Interaktionspartner:innen abhängig vom Spielzeug: Während die untersuchten Kinder mit SEND beim Spielen mit „isoliertem" Spielzeug signifikant mehr mit anderen Kindern mit SEND interagierten, interagierten sie beim Spielen mit „sozialem" Spielzeug signifikant mehr mit Kindern ohne SEND (O'Gorman Hughes & Carter, 2002). Hierbei handelt es sich jedoch um eine sehr kleine Studie, deren Ergebnisse dadurch nur begrenzt generalisierbar sind.

Aufgrund der wenigen Studien zu Auswirkungen von Spielzeug und Spielaktivitäten auf die Interaktionen von Kitakindern mit und ohne SEND und der abweichenden Ergebnisse abhängig von Studiendesign und Setting ist weitere Forschung zum Potential von Spielaktivitäten zur Verbesserung der Peer-Interaktionen von Kindern mit SEND nötig. Hierzu möchte die vorliegende Arbeit einen Beitrag leisten (Paper 1) – neben dem Ansatz, Gebärden(sprachen) zur Verbesserung der Kommunikation und damit der (Peer-)Interaktionen anzubieten (Paper 2, 3 und Poster), wozu im Folgenden der aktuelle Forschungsstand vorgestellt wird.

3.2. Gebärden(sprachen) für Kinder mit und ohne SEND – Forschungsstand

3.2.1. Gebärdenerwerb und -nutzung von Kindern mit verschiedenen Voraussetzungen

Wie bereits erwähnt, sind insbesondere Kinder mit einem Förderbedarf im Bereich (Laut-)Sprache gefährdet, aus Peer-Interaktionen in Kitas ausgeschlossen zu werden (Odom et al., 2002). Dies betrifft gerade auch Kinder mit Hörbehinderung, die aufgrund ihrer auditiv eingeschränkten Wahrnehmung von Lautsprache nur begrenzt Zugang zu den meist lautsprachlich stattfindenden Peer-Interaktionen haben: So zeigen zahlreiche Studien, dass taube und schwerhörige Kinder in lautsprachlich ausgerichteten Kitasettings weniger mit Gleichaltrigen interagieren und weniger in soziales Spiel eingebunden sind als Kinder ohne Hörbehinderung (für einen Überblick siehe Antia et al., 2011). Taube und schwerhörige Kinder können jedoch über eine in der visuell-gestischen Modalität produzierte und rezipierte Gebärdensprache vollständigen Zugang zu Kommunikation und Interaktionen erhalten und daran teilhaben (Marschark et al., 2006). Mehrere Studien legen nahe, dass aus Gebärdensprachen entnommene Gebärden auch Kindern mit anderen Diagnosen Möglichkeiten zur Verbesserung der Kommunikation und damit zur Partizipation an Interaktionen bieten können: So wurde unter anderem gefunden, dass ein Angebot von Gebärden die Kommunikation für Kinder mit Trisomie 21 (Kay-Raining Bird et al., 2000; Kiesel et al., 2009; Wagner & Sarimski, 2012), mit Sprachentwicklungsverzögerungen oder -störungen (Ellis Weismer & Hesketh, 1993; Lüke & Ritterfeld, 2014; Vogt & Kauschke, 2017) und für Kinder mit Autismus-Spektrum-Störungen (Bonvillian et al., 1981; Goldstein, 2002; Nunes, 2008) erweitern oder überhaupt erst ermöglichen kann. Selbst Kinder ohne SEND scheinen vom Einsatz von Gebärden in ihrer Sprachentwicklung zu profitieren (Capone Singleton, 2012; Ellis Weismer & Hesketh, 1993; Goodwyn et al., 2000; Mumford & Kita, 2014; Vogt & Kauschke, 2017). Auch innerhalb verschiedener Kitasettings wurde deshalb der Einsatz von lautsprachunterstützenden Gebärden (LUG) implementiert und teilweise evaluiert. Im Folgenden wird der aktuelle Forschungsstand zum Gebärdenlern- und -nutzungsverhalten von Kindern mit und ohne SEND in Kitasettings mit unterschiedlichem Gebärden(sprach)angebot und unterschiedlicher Gruppenzusammensetzung skizziert.

3.2.2. Gebärdenerwerb und -nutzung in verschiedenen Settings

I. Kitagruppen mit lautsprachunterstützenden Gebärden (LUG)

Studien aus unterschiedlich zusammengesetzten Kitagruppen legen nahe, dass lautsprachunterstützend angebotene Gebärden (LUG) von Kindern mit und ohne SEND in verschiedenem Maße angenommen und genutzt werden: So zeigte eine Studie an Kitakindern ohne SEND in den USA, dass die Kinder die ihnen angebotenen Gebärden lernten und dadurch in ihrer Lautsprachentwicklung Kindern ohne Gebärdenangebot voraus waren (Daniels, 1994). Auch eine weitere US-amerikanische Studie an Kindern mit und ohne Förderbedarf im Krippenalter (1;3 bis 3;0 Jahre) bestätigte, dass die Kinder einige Gebärden lernten, ohne dass ihre Lautsprachentwicklung gehemmt wurde (DiCarlo et al., 2001). Übereinstimmend berichtet eine niederländische Studie an Kitakindern mit starker Sprachentwicklungsverzögerung (2;6 bis 4;7 Jahre), deren pädagogische und therapeutische Fachkräfte ihnen LUG anboten, dass die Kinder einige Gebärden lernten und nutzten – insbesondere zu Zeitpunkten, an denen sie wenig lautsprachlich kommunizierten bzw. kommunizieren konnten (Wijkamp et al., 2010). Da jedoch bislang größere, förderschwerpunktübergreifende Studien zum Gebärdenerwerb und zur Gebärdennutzung im natürlichen Setting inklusiver Kitagruppen fehlten, wurde im Rahmen des Projektes „‚Unterstützte Kommunikation für alle' als inklusives Lehr- und Lernfeld in Kindertageseinrichtungen", aus dem die in dieser Arbeit vorgestellten Untersuchungen hervorgegangen sind, das Gebärdenlern- und -nutzungsverhalten von Kindern mit und ohne SEND in inklusiven Kitagruppen sowie Einflussfaktoren hierauf analysiert. Die bereits aus diesem Projekt heraus entstandenen Publikationen deuten ebenfalls darauf hin, dass Kinder mit und ohne SEND Gebärden lernen (Schüler et al., 2021; Schüler & Hänel-Faulhaber, 2022, 2023). Hierfür scheinen insbesondere ein fortgeschrittener Sprachentwicklungsstand der Kinder und eine hohe Implementierung durch die Fachkräfte hilfreich zu sein – die wiederum von Bedingungen wie wahrgenommener Wertschätzung, einem guten Teamklima sowie einer sinnvollen Struktur des ausreichend umfangreichen Weiterbildungsangebotes abhängt (diess.). Ob beim Erlernen von Gebärden Ikonizität eine Rolle spielt (Paper 2) und wovon das Gebärdennutzungsverhalten der Kinder abhängt (Poster), wird in Publikationen dieser Arbeit thematisiert.

Untersuchungen an Kindern mit (hochgradiger) Hörbehinderung legen jedoch nahe, dass ein Angebot mit lediglich lautsprachunterstützenden Gebärden für diese Zielgruppe häufig nicht ausreicht, um sprachliche Inhalte zu transportieren, vor allem, wenn eher wenig Gebärden eingesetzt werden (z.B. Preisler et al., 2002). Diese Kinder kommunizieren bei fehlender Gebärden(sprach)kompetenz in solchen Settings meist nonverbal (Preisler et al., 2002). Deshalb werden insbesondere für die Zielgruppe hochgradig schwerhöriger oder tauber Kinder gebärdensprachkompetente Fachkräfte benötigt, um Kommunikation und die möglichst gleichberechtigte Partizipation an (Peer-) Interaktionen zu ermöglichen. Inwieweit das in verschiedenen Settings gelingt, wird anhand des Forschungsstandes in den folgenden beiden Absätzen thematisiert.

II. Co-Enrollment mit gebärdensprachkompetenter Fachkraft

Eine Möglichkeit, taube oder hochgradig schwerhörige Kinder, die kaum Zugang zu Lautsprache haben, dennoch an Kommunikation und (Peer-)Interaktionen in Kitas teilhaben zu lassen, ist, ihnen eine gebärdensprachkompetente Fachkraft zur Verfügung zu stellen. Dies kann entweder eine hörende Fachkraft sein, die Inhalte übersetzt und Gebärden an die Fachkräfte und Kinder vermittelt mit dem Ziel, dass das taube Kind in einem möglichst barrierefreien Umfeld kommunizieren kann (Goppelt, 2015). Oder aber eine taube Fachkraft fungiert als Sprachvorbild und Kommunikationspartner:in für alle in der Gruppe, was den aus Forschungen in bilingualen Kitas bekannten Vorteil hat, dass die hörenden Personen darauf angewiesen sind, die „Zweitsprache“ Gebärdensprache zu nutzen und dies dadurch eher tun (Goppelt, 2016; Wode, 2009). Jedoch müssen hier zunächst Wege für die Übermittlung der Inhalte bei noch fehlender Gebärdensprachkompetenz der hörenden Gruppenmitglieder gefunden werden.

Bei von Preisler et al. (2002) untersuchten tauben Kindern mit Cochlea-Implantaten (CI) in Schweden, die von einer hörenden gebärdensprachkompetenten Fachkraft begleitet wurden, wurde beobachtet, dass die tauben Kinder vor allem mit der gebärdensprachkompetenten Fachkraft kommunizierten. Im Spiel mit hörenden Kindern übernahmen sie Rollen ohne verbale Kommunikation (Preisler et al., 2002). Studien zum Co-Enrollment einzelner tauber Kinder mit einer tauben Fachkraft in einem inklusiven Setting mit hörenden Kindern mit und ohne SEND sind mir nicht bekannt, weshalb ich das Gebärdenlern- und -nutzungsverhalten sowie das

Interaktionsverhalten der Kinder mit und ohne SEND in einer solchen inklusiven Kitagruppe im Rahmen dieser Arbeit untersucht habe (Paper 3).

III. Bimodal-bilinguale Kitagruppen

Bimodal-bilinguale Kitagruppen, in denen von Fachkräften mit und ohne Hörbehinderung neben der nationalen Lautsprache auch die nationale Gebärdensprache für alle Kinder angeboten wird, werden von Selbsthilfe- und Fachverbänden als das Setting mit den besten Entwicklungsbedingungen für Kinder mit Hörbehinderung favorisiert (z.B. Bundeselternverband gehörloser Kinder, 2010; DG, 2011). Solche Gruppen sind zwar nicht flächendeckend verfügbar, sodass viele Kinder mit Hörbehinderung in den beiden Absätzen zuvor beschriebene Settings besuchen. Vor dem Hintergrund der Forschungslage ist die Favorisierung jedoch nachvollziehbar, da durch das Angebot einer visuell voll zugänglichen Sprache auch Kinder mit Hörbehinderung an (Peer-)Interaktionen teilhaben und von den damit verbundenen Vorteilen für ihre sprachliche, sozial-emotionale und kognitive Entwicklung profitieren können. Eine wichtige Voraussetzung dafür jedoch ist auch hier, dass alle Gruppenmitglieder ausreichend Gebärdensprache lernen und nutzen. Aufgrund des höheren gebärdensprachlichen Inputs im Vergleich zu den bisher vorgestellten Settings und aufgrund der höheren Anzahl an Gruppenmitgliedern mit Hörbehinderung ist es wahrscheinlicher, dass in einem bimodal-bilingualen Setting Gebärdensprache gelernt und für Peer-Interaktionen genutzt wird, was im Einklang mit Ergebnissen aus monomodal-bilingualen Kitagruppen steht, also Kitagruppen, in denen zwei Lautsprachen angeboten werden (Wode, 2009). Tatsächlich lernen und nutzen Kinder in bimodal-bilingualen Kitagruppen Gebärdensprache, jedoch in unterschiedlichem Maße: Eine Untersuchung von Schulz (2016) in der Berliner Kita Sinneswandel zeigte, dass die meisten Kinder mit Hörbehinderung fast ausschließlich mit anderen Kindern mit Hörbehinderung gebärdensprachlich kommunizierten und die meisten hörenden Kinder fast ausschließlich mit anderen hörenden Kindern in Lautsprache. Ein Teil der Kinder bewegte sich jedoch in beiden Sprachgruppen (diess.). Die Präferenz von Kitakindern in Settings mit Lautsprache und Gebärden(sprache) für Kinder mit dem gleichen Hörstatus wurde so auch in anderen Studien gefunden (z.B. Antia et al., 1993; Ardito et al., 2008; Arnold & Tremblay, 1979; Minnett et al., 1994; Spencer et al., 1994; für einen Überblick siehe Antia et al.,

2011). Auch in monomodal-bilingualen Kitas wird die Zuordnung der Kinder zu Sprachgruppen beobachtet (z.B. Schelletter, 2016).

Um herauszufinden, wie sich das Gebärdenlern- und -nutzungsverhalten in bimodal-bilingualen Kitagruppen im Vergleich zu den bisher vorgestellten Settings gestaltet, war auch in diesem Setting eine Untersuchung mit den gleichen, leicht modifizierten und erweiterten Untersuchungsmethoden geplant. Aufgrund der COVID-19-Pandemie mussten die Erhebungen leider sehr kurzfristig abgesagt werden und konnten aus strukturellen und ressourcenbedingten Gründen im Rahmen dieser Arbeit nicht mehr nachgeholt werden. Daher wird der Fokus hier auf den bereits genannten Schwerpunkten liegen.

4. Zusammenfassung und offene Fragen

Studien zeigen, wie wichtig Peer-Interaktionen für die sozial-emotionale und kognitive Entwicklung von Kindern sind (Guedes et al., 2020; Kluczniok & Schmidt, 2021; Rubin et al., 2011; Valiente et al., 2020; Vitiello et al., 2012). Kinder mit SEND sind jedoch gefährdet, weniger an Peer-Interaktionen partizipieren zu können (Antia et al., 2012; Guralnick et al., 1996, 2006; Odom et al., 2002, 2004). Um ihre Partizipation an Peer-Interaktionen zu verbessern, können verschiedene Ansätze gewählt werden (siehe z.B. Driscoll & Carter, 2009; Kim et al., 2003; Odom et al., 1993; O'Gorman Hughes & Carter, 2002). Im Rahmen dieser Arbeit wird untersucht, inwieweit Spielaktivitäten und ein Angebot von lautsprachunterstützenden Gebärden und Gebärdensprache Förderfaktoren darstellen können und wovon dies abhängt.

Mehrere Studien legen nahe, dass angebotene Spielzeuge bzw. -aktivitäten einen Einfluss auf die Peer-Interaktionen von Kindern mit und ohne SEND haben (Ivory & McCollum, 1999; Kim et al., 2003; Martin et al., 1991; Rubin & Howe, 1985; Trawick-Smith et al., 2011). Die Forschungsergebnisse unterscheiden sich jedoch abhängig vom Studiendesign und der Gruppenzusammensetzung. Zudem ist die Studienlage eher dünn; insbesondere besteht ein Mangel an förderschwerpunktübergreifenden Studien im natürlichen Setting inklusiver Kitas. Deshalb wird im Rahmen der ersten Studie zunächst untersucht, ob und inwieweit sich die Kinder mit SEND dieser großen Stichprobe in der Häufigkeit ihrer Peer-Interaktionen von den ebenfalls beobachteten Kindern ohne SEND unterscheiden. Daraufhin wird analysiert, ob sich die Kinder mit

und ohne SEND darin unterscheiden, bei welchen Spielaktivitäten ihre Interaktionen stattfinden und ob sich auch ihre Interaktionspartner:innen abhängig von den Spielaktivitäten unterscheiden (Studie 1).

Insbesondere eingeschränkte (laut-)sprachliche Kompetenzen stellen einen Risikofaktor für eine geringere Partizipation an Peer-Interaktionen dar (Odom et al., 2002). Studien zeigen, dass Kinder mit und ohne SEND in ihrer Kommunikation und möglicherweise ihren (Peer-)Interaktionen von Gebärden(sprache) profitieren können. Deshalb wird untersucht, inwieweit Kinder in inklusiven Kitagruppen lautsprachunterstützend angebotene Gebärden lernen und für Peer-Interaktionen nutzen – und von welchen Faktoren dies abhängt. Beim Gebärdenlernverhalten wird der Fokus darauf gelegt, ob Ikonizität hierbei, wie häufig angenommen, eine Rolle spielt (Studie 2). Zudem wird zusammenfassend dargestellt, welche weiteren untersuchten Faktoren Einfluss darauf haben und wovon das Gebärdennutzungsverhalten der Kinder abhängt (Poster). Um zu analysieren, inwieweit sich das Gebärdenlern- und -nutzungsverhalten von Kindern mit und ohne SEND in einem Setting mit höherem Gebärden(sprach)input und einem höheren Gebärden(sprach)nutzungsbedarf von den zuvor untersuchten Gruppen unterscheidet, wird dies mit vergleichbaren Erhebungsmethoden in einer inklusiven Kitagruppe mit einer tauben Fachkraft und einem tauben Kind untersucht (Studie 3).

Kapitel II

Einzelarbeiten

Peer interactions in inclusive day care centers – the type of play activity matters

(Paper 1)

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Abstract

Early peer interactions impact children's social-emotional and academic development. Studies show that children with special educational needs and/or disabilities (SEND) are at considerable risk of being less involved in peer interactions. Play activities represent a variable that has been little studied to date and can affect peer interactions of children with and without SEND significantly. For this reason, this study investigated whether and to what extent interactions between children with and without SEND differ in the non-experimental setting of inclusive daycare centers and how this is affected by play activities. This was investigated using questionnaire and video data during free play with 75 children, 27 of whom had SEND. Consistent with previous studies, we found that children with SEND tended to be less involved in peer interactions and were significantly more involved in interactions with teachers than children without SEND. In contrast to previous studies from experimental settings that categorized activities such as painting, doing handcrafts or puzzling as isolate, interactions of children with SEND occurred most frequently and significantly more frequently when painting, doing handcrafts or puzzling than of children without SEND. Consistent with a small study, children with SEND played in such "isolate" contexts at a significantly higher rate with children with SEND than with children without SEND compared to play activities categorized as social. Children without SEND chose their interaction partners, with or without SEND, regardless of the play activity. We conclude that these "isolate" play activities should be reconsidered as potential opportunities for interactions of children with SEND.

Keywords: Interactions · Preschool · Inclusion · Play activities · SEND

Peer-Interaktionen in inklusiven Kitas – die Art der Spielaktivität ist entscheidend

Zusammenfassung

Frühe Peer-Interaktionen beeinflussen die sozial-emotionale und akademische Entwicklung von Kindern. Studien zeigen, dass bei Kindern mit sonderpädagogischem Förderbedarf und/oder Behinderungen (SEND) ein erhebliches Risiko besteht, weniger in Peer-Interaktionen eingebunden zu sein. Spielaktivitäten stellen eine bisher wenig untersuchte Variable dar, die sich auf die Peer-Interaktionen von Kindern mit und ohne SEND deutlich auswirken kann. Deshalb wurde in dieser Studie untersucht, ob und inwieweit sich die Interaktionen zwischen Kindern mit und ohne SEND in der natürlichen Umgebung von inklusiven Kindertageseinrichtungen unterscheiden und wie dies durch Spielaktivitäten beeinflusst wird. Dies wurde anhand von Fragebogen- und Videodaten während des Freispiels mit 75 Kindern, von denen 27 SEND hatten, untersucht. Übereinstimmend mit früheren Studien fanden wir heraus, dass Kinder mit SEND tendenziell weniger in Interaktionen mit Gleichaltrigen und signifikant mehr in Interaktionen mit Erzieher:innen involviert waren als Kinder ohne SEND. Im Gegensatz zu früheren Studien aus experimentellen Settings, die Aktivitäten wie Malen, Basteln oder Puzzeln als isoliert einstuften, traten Interaktionen bei Kindern mit SEND am häufigsten und signifikant häufiger beim Malen, Basteln oder Puzzeln auf als bei Kindern ohne SEND. In Übereinstimmung mit einer kleinen Studie spielten Kinder mit SEND in solchen „isolierten“ Kontexten signifikant häufiger mit Kindern mit SEND als mit Kindern ohne SEND im Vergleich zu Spielaktivitäten, die als sozial eingestuft wurden. Kinder ohne SEND wählten ihre Interaktionspartner:innen, mit oder ohne SEND, unabhängig von der Spielaktivität. Wir kommen zu dem Schluss, dass diese „isolierten“ Spielaktivitäten als potenzielle Chancen für Interaktionen von Kindern mit SEND überdacht werden sollten.

Schlüsselwörter: Interaktionen · Kitas · Inklusion · Spiel · Aktivitäten · SEND

1. Introduction

1.1. Impact of peer interactions

Interactions in early childhood education and care settings crucially influence children's social-emotional and academic development (Broekhuizen et al. 2016; Heckman 2006; Mashburn et al. 2008). This applies not only to teacher-child interactions, but also to interactions with peers (Guedes et al. 2020; Kluczniok and Schmidt 2021; Rubin et al. 2011; Valiente et al. 2020; Vitiello et al. 2012). Engaging successfully in peer interactions has been shown to improve children's self-esteem, their social acceptance, and their relationship skills as well as to reduce their risk of depression in middle and later life (Antia 1994; DeLuzio and Girolametto 2011; Jiang and Wang 2020; Ladd 2005). Moreover, it has been reported that through interactions with peers, children acquire the social skills necessary for initiating and maintaining friendships (Garvey 1984; Rubin 1980). Thus, peer interactions are pivotal, profoundly shaping children's social, emotional, and academic development (Valiente et al. 2020; Vitiello et al. 2012). This significance has made it an important area for scientific inquiry, resulting in a growing interest in research within this field (Booren et al. 2012; Corsaro 2013; Kluczniok and Schmidt 2021; Smidt and Embacher 2020; Vitiello et al. 2012). Given the significant influence of peer interactions, it is important to consider the interaction experiences of children with special educational needs and/or disabilities (SEND) in these settings and how interactions can be intentionally facilitated.

1.2. Peer interactions of children with and without SEND

1.2.1. Duration and frequency

Preschool children with SEND are reported to have fewer and shorter peer interactions than children without SEND (Antia et al. 2012; Guralnick et al. 1996, 2006). Overall, children with SEND are at a higher risk of being excluded from peer interactions and less socially integrated (Guralnick et al. 1996; Odom et al. 2002, 2004). Developmental language disorders (DLD) and a lack of social skills have been identified as risk factors for exclusion from peer interactions (Odom et al. 2002). Certain children with SEND have been observed to interact more with teachers than with peers (Kniel and Kniel 1984), which has been identified as another risk factor for

social exclusion. Children who predominantly interact with teachers are more likely to be excluded from interactions by their peers (Odom et al. 2002).

1.2.2. Free play activities as an influential variable

Free play is an activity that has been shown to be positively related to peer interactions (Booren et al. 2012; Guedes et al. 2020; Kluczniok and Schmidt 2021; Smidt and Embacher 2020; Suchodoletz et al. 2015; Vitiello et al. 2012). However, merely placing children with and without SEND together in a free play setting is not sufficient for children with SEND to participate equally in peer interactions and benefit from them (Driscoll and Carter 2009; Grubbs and Niemeyer 1999; Kreuzer and Ytterhus 2013). Rather, children with SEND may need planned interventions for successful peer interactions (Driscoll and Carter 2009; Grubbs and Niemeyer 1999; McConnell 2002). Planned interventions not only include teacher-led, child-specific, or peer-mediated approaches, but also involve the manipulation of contexts, such as varying toys to increase the probability of behaviors like initiating peer interactions (Driscoll and Carter 2009; Kim et al. 2003; Odom et al. 1993; O'Gorman Hughes and Carter 2002).

1.2.3. Social vs. isolate toys

Many studies have shown that the selection of activities and toys has an impact on peer interactions (Ivory and McCollum 1999; Kim et al. 2003; Martin et al. 1991; Rubin and Howe 1985; Trawick-Smith et al. 2011). Most experimental studies have identified similar types of toys as social toys that can scaffold peer interactions between children with and without SEND (Kim et al. 2003). Balls, blocks, dress-up clothes, housekeeping toys, puppets, and toy cars or trucks have been classified as *social toys* (Kallam and Rettig 1991; Kim et al. 2003; Ivory and McCollum 1999). By contrast, puzzles, Play-Doh, books, or art materials have been identified as *isolate toys*, that children are more likely to use playing alone (Kallam and Rettig 1991; Kim et al. 2003). An experimental study by Beckman and Kohl (1984) found that children with and without SEND interacted more in the social toy condition in integrated and segregated settings. By contrast, other experimental studies found that children with SEND in particular were more likely to interact with peers when playing with social toys than when playing with isolate toys, while the differences were not significant for children without SEND (Kallam and Rettig 1991; Martin et al. 1991). However, in

non-experimental studies in regular preschool settings, children without SEND were found to interact significantly more often with peers when playing with social toys than with isolate toys (Rubin 1977a, 1977b; Trawick-Smith et al. 2011).

So far, only very few studies have investigated the effect of type of toy on peer interactions in non-experimental inclusive settings. In contrast to experimental studies, those studies found little or no effects of social vs. isolate toys on peer interactions between children with SEND and their peers (Driscoll and Carter 2009; O'Gorman Hughes and Carter 2002). O'Gorman Hughes and Carter (2002) observed that children with SEND interacted more with children with SEND when playing with isolate toys. Conversely, children with SEND interacted more with children without SEND when playing with social toys (O'Gorman Hughes and Carter 2002). However, it is important to note that this study included only two children with SEND and their interaction partners, which limits the generalizability of the findings.

1.3. The current study

Overall, there is little research on peer interactions in early childhood education and care settings (Kluczniok and Schmidt 2021) as well as on ecological factors on peer interactions (Heimlich 2017). Analyses of the relationship between peer interactions and activity settings are even rarer (Kluczniok and Schmidt 2021). Moreover, the findings concerning the role of social and isolate toys on peer interactions of children with and without SEND from experimental studies vs. studies in non-experimental settings have been inconsistent (Driscoll and Carter 2009). The number of studies in non-experimental settings remains small. Therefore, we investigated whether children with and without SEND differ in their play activities during interactions in inclusive day care centers. In addition, we examined if children with and without SEND choose different interaction partners (with vs. without SEND), depending on social or isolate play activities.

2. Methods

2.1. Participants

Our sample comprised 75 children from nine inclusive day care groups (age: 3;0 to 6;6 years, mean: 4;3 years). Of these, 48 children (age: 3;0 to 5;9 years, mean: 4;1 years)

did not receive any kind of therapy and did not have a diagnosed disability. The other 27 children (age: 3;1 to 6;6 years, mean: 4;7 years) were reported to receive at least one type of therapy and 14 of them were reported to have a diagnosed disability. Most of them (n = 20) received a combination of therapies, six of them received speech therapy only, and one child was reported to receive curative education.

2.2. Materials and methods

To grasp children's demographic information and language skills, a questionnaire was handed out to their parents and preschool teachers. In this questionnaire, characteristics, such as the child's age, therapies, disabilities, and level of language development, were recorded (for details, see Supplementary Material A).

To analyze children's interactions, a video analysis was conducted. Videos were recorded during free play on two days as close together as possible. The teachers were asked not to instruct any activities, but to be available if requested. To be able to record all play areas from different perspectives, about eight to 12 cameras were placed in the rooms of the kindergarten groups where the participating children usually played. On each of the two days, the cameras were switched on for one hour in each group during free play sessions.

Of the two recorded days, 10 minutes were coded for each child for each of the two days. Coding started half an hour after the beginning of the recording to ensure that the children no longer paid attention to the cameras and behaved as usual during free play. If children were present on only one of these two days, an additional 10min of the same day were coded. For this purpose, a slot was selected that was far away from the previously coded slot, but also not at the beginning of the recording to ensure that children had adapted to the cameras. In most cases, the remaining 10 minutes of video data for these children were coded from minutes 5 to 15 or from minutes 10 to 20. If children were not or barely visible at a planned coding slot, a different slot was selected. This approach ensured that children were visible over 90% of the 20min duration of the selected video material. Coding comprised variables such as frequency and duration of interactions, play activities, as well as interaction partners (for details, see Supplementary Material B). Play activities included all activities that occurred during free play and had a large overlap with toy categories from experimental studies (Kim et al. 2003; O'Gorman Hughes and Carter 2002). The data was coded by four

student assistants that were trained to use this coding scheme. They were only approved for final coding once they had achieved a kappa value of at least .70 for the variable of an interaction of a child. The final kappa for an interaction per child was between .72 and .89. For the variable “play activity”, the final kappa was between .54 and .71.

3. Analysis

3.1. Duration of interactions

First, we examined whether SEND or interaction partner (*child* vs. *adult*) had an influence on the amount of time that children spent in interactions. Children’s interaction durations were calculated in relation to the time they were visible to the cameras. For this purpose, the duration of each interaction was divided by the total time a child was visible. The calculated value was multiplied with the total time coded per child (1200 s). Hereafter, the total interaction times were calculated for each child and interaction partner combination as the sum of all interactions in seconds.

The Levene-Test for interactions with adults was significant (p = .025). Thus, we conducted a robust two-way ANOVA using the WRS2-package (Mair and Wilcox n.d.) in R (Version 4.2.2, R Core Team 2022). Using rstatix (version 0.7.2, Kassambra 2023) we identified four outliers in the variable sum of interaction times (criteria: values larger than the 3rd quantile plus 1.5 times the interquartile range or smaller than the 1st quantile minus 1.5 times the interquartile range) and excluded them from further analysis. These outliers were characterized by disproportionately long interaction times with adults, involving three children without SEND and one child with SEND. As fixed effects, we entered SEND (*yes*, *no*), the interaction partner (*child*, *adult*), as well as their interaction terms into the model. Post-hoc comparisons of significant interactions were conducted using the Wilcoxon rank sum tests.

3.2. Play activities

In a next step, we investigated the extent to which SEND and play activity were related to the number of interactions of a child using a generalized linear mixed model (GLMM) with a zero-inflated negative binomial distribution using the package

glmmTMB (Brooks et al. 2017a) in R (Version 4.2.2, R Core Team 2022). As fixed effects, we entered activity (*block building*, *exploring a toy*, *painting/crafting/puzzling*, *role play*, *romping/dancing/gymnastics*), SEND (*yes*, *no*), and their interaction terms into the model. Only activities which took up 10% or more of the time of total interactions were included in the analysis. Moreover, only children who had at least one interaction in these activities were included in the analysis. This led to the exclusion of seven activities (board/rule game, conversation, moving through the room, other, reading aloud, resting/lying down, setting up/removing/putting away) and three children (two children without SEND and one child with SEND). As random effects, we included intercepts for each child nested in group. Significance of fixed effects was assessed with likelihood ratio tests comparing the model with the maximal fixed effects structure and a model that excluded the fixed effect of interest. These comparisons employed Type II Wald chisquare tests. Fixed effects were considered significant at $p < .05$. Post-hoc comparisons of significant interactions were conducted using approximate tests on the estimated marginal means (emmeans package; emmeans version 1.4.8—Lenth 2020). The resulting *p*-values were corrected for multiple comparisons following the procedure proposed by Tukey (1977).

3.3. Interaction partners during play activities

For the analysis of the influence of play activity and SEND on the choice of interaction partner (with vs. without SEND), we followed a statistical approach similar to the one described above. We fitted a GLMM with a binomial distribution. Play activity (*social*, *isolate*), SEND (*yes*, *no*), as well as their interaction terms were included as fixed effects into the model. Only interactions with interaction partners for whom we had information on whether they had SEND or not were included in the analysis. This led to the exclusion of 770 of 2357 interactions. Of the remaining 1587 interactions, we removed those that took place in activities in which less than 10% of the interactions took place (n = 249). Only interactions in activities that could be unequivocally identified as social or isolate were included in the analysis. Thus, we excluded interactions in the activity "exploring a toy" (n = 149). We grouped the remaining 1189 interactions that took place in four play activities into *isolate* (*painting/crafting/puzzling*, n = 235) and *social* (*block building*, *role play*, *romping/dancing/gymnastics*, n = 954).

3.4. Involvement of teachers

In order to analyze whether and to what extent the results of this analysis could be biased by varying teacher involvement depending on play activities and if play activities were teacher-led despite the instruction not to lead activities, another GLMM with a binomial distribution was conducted with activity (*social*, *isolate*) as the dependent variable and interaction partner (*teacher*, *child*) and initiator (*yes*, *no*) as well as their interaction terms as fixed effects. GLMMs were evaluated for uniformity of residuals, overdispersion, zero-inflation, and heteroscedasticity using the R package DHARMa version 0.3.2.0 (Hartig 2022).

4. Results

4.1. Duration of interactions

The data summarized per group and interaction partner are shown in Fig. 1 and Table 1. The robust ANOVA revealed a significant main effect for interaction partner and a significant interaction between SEND and interaction partner (see Table 2). Post hoc tests revealed that children with SEND tended to spend less time in peer interactions than children without SEND (W= 740, p= .065). Moreover, children with SEND were significantly longer in interactions with teachers than children without SEND (W= 363, p= .008).

Figure 1 | Interaction times of children with and without SEND summarized per interaction partner. Each line represents one participant.

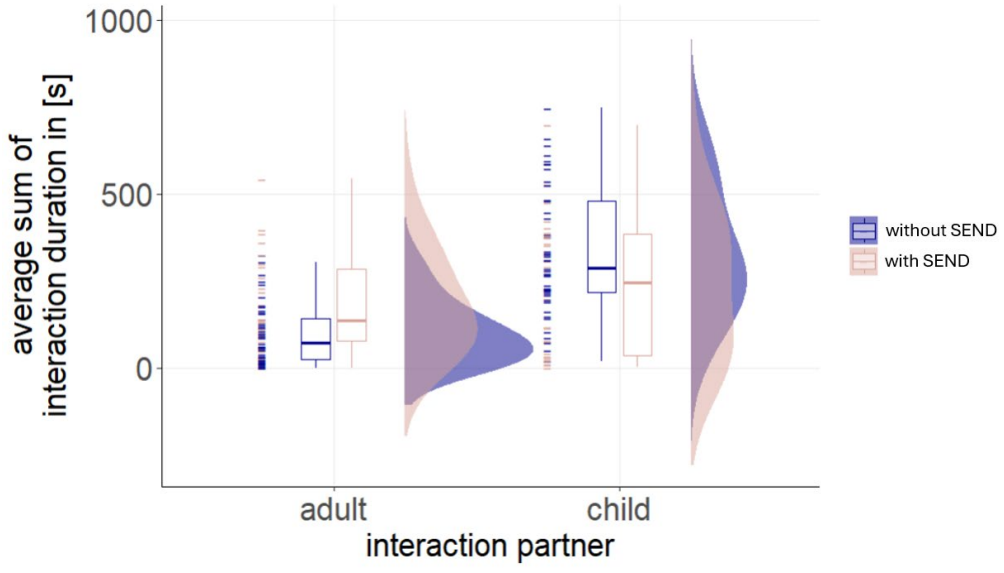

Table 1 | Results of the robust ANOVA with sum of interaction time as the dependent variable.

	value	p-value
SEND	0.021	.887
Interaction partner	**17.384**	**.001**
SEND x interaction partner	**5.955**	**.019**

Table 2 | Descriptive statistics of the variable sum of interaction durations of children with and without SEND (in seconds, in relation to the time the children were visible to the cameras during the 20 minutes that were coded)**.**

Interactions	SEND	Min.	1st Qu.	Median	Mean	3rd Qu.	Max.
In total	no	109.4	300.8	467.1	439.3	567.4	856.0
	yes	61.8	317.2	432.8	432.9	515.8	837.6
with children	no	9.3	194.2	275.3	315.2	457.0	747.3
	yes	1.1	34.1	198.8	228.0	384.7	699.2
with teachers	no	3.1	32.8	93.1	129.5	164.2	634.8
	yes	22.4	89.1	140.7	212.9	299.5	786.4

4.2. Play activities

The data summarized per activity and group are shown in Fig. 2 and Table 3. The GLMM assessing the effects of SEND and play activities on the number of interactions revealed an interaction between group (children with vs. without SEND) and activity, however, this was only a trend (see Table 4). Given that we had *a priori* hypotheses that the number of interactions for children with and without SEND would differ across the different activities we compared the groups within in each activity. These post-hoc tests revealed that the interactions of children with SEND took place to a significantly higher proportion when they were painting, doing handcraft or puzzling than the interactions of children without SEND (see Table 5). For all the other play activities, we did not observe significant differences in the number of interactions between children with SEND and those without.

Figure 2 | Number of interactions summarized per activity and group. Error bars indicate 95% confidence intervals.

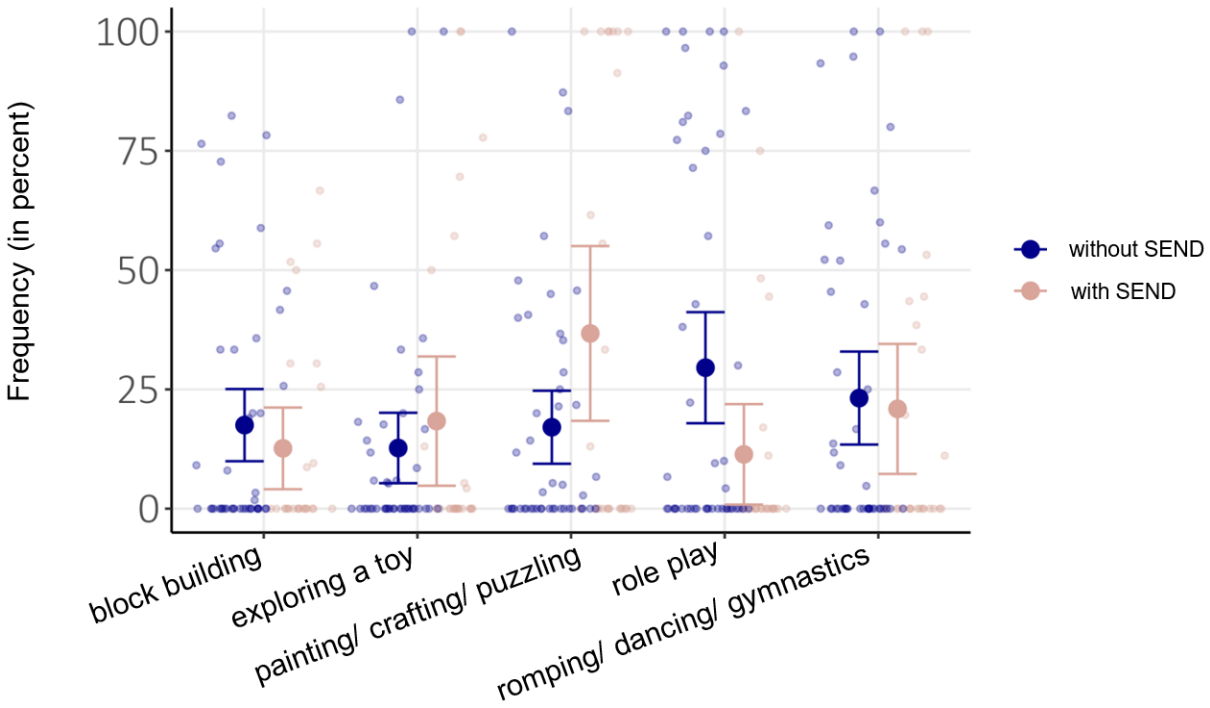

Table 3 | Estimated marginal means (EMMs) and 95% confidence intervals (CIs) summarized per activity and group. Confidence level used: 0.95. Intervals were back-transformed from the log scale.

Activity	SEND	response	SE	df	lower.CL	upper.CL
Block building	no	6.24	1.15	346	4.34	8.97
	yes	5.45	1.58	346	3.08	9.62
Exploring a toy	no	5.10	1.09	346	3.35	7.75
	yes	7.80	2.33	346	4.34	14.04
Painting/ crafting/	no	5.56	1.06	346	3.83	8.09
puzzling	yes	13.35	3.66	346	7.79	22.90
Role play	no	10.59	2.01	346	7.28	15.39
	yes	7.08	2.38	346	3.65	13.73
Romping/	no	8.62	1.64	346	5.93	12.54
dancing/	yes	8.57	2.34	346	5.00	14.68
gymnastics						

Table 4 | Results of the GLMM with number of interactions as the dependent variable.

	Chisq	df	Pr(>Chisq)
Activity	7.192	4	0.126
SEND	1.270	1	0.260
Activity x SEND	*8.245*	*4*	*0.083.*

Table 5 | Post hoc tests assessing the effect of group within each activity. P-value adjustment: Sidak method for 5 tests. Tests were performed on the log scale.

Contrast	Activity	ratio	SE	df	t-ratio	p-value
	Block building	1.146	0.391	346	0.399	.997
	Exploring a toy	0.653	0.238	346	-1.169	.752
Without/with SEND	**Painting/ crafting/ puzzling**	**0.417**	**0.139**	**346**	**-2.628**	**.044**
	Role play	1.496	0.575	346	1.047	.827
	Romping/ dancing/ gymnastics	1.006	0.333	346	0.018	1.000

4.3. Interaction partners during play activities

The results of the GLMM assessing the effect of SEND and play activity on the interaction partner are presented in Table 6. Overall, the probability that children would interact with children with SEND was quite low (see Table 7). The model revealed a significant interaction between play activity (*social* vs. *isolate*) and SEND (*yes*, *no*). Post hoc tests showed that children with SEND were more likely to interact with children with SEND in isolate play activities than in social play activities (see Table 7 for EMMs and Table 8 for post hoc tests). For children without SEND, the play activity did not seem to have an effect on the choice of their interaction partners (with vs. without SEND, see Fig. 3, top row).

Figure 3 | Estimated marginal means of the probabilities of interacting with someone with SEND for children with and without SEND in isolate vs. social play activities.

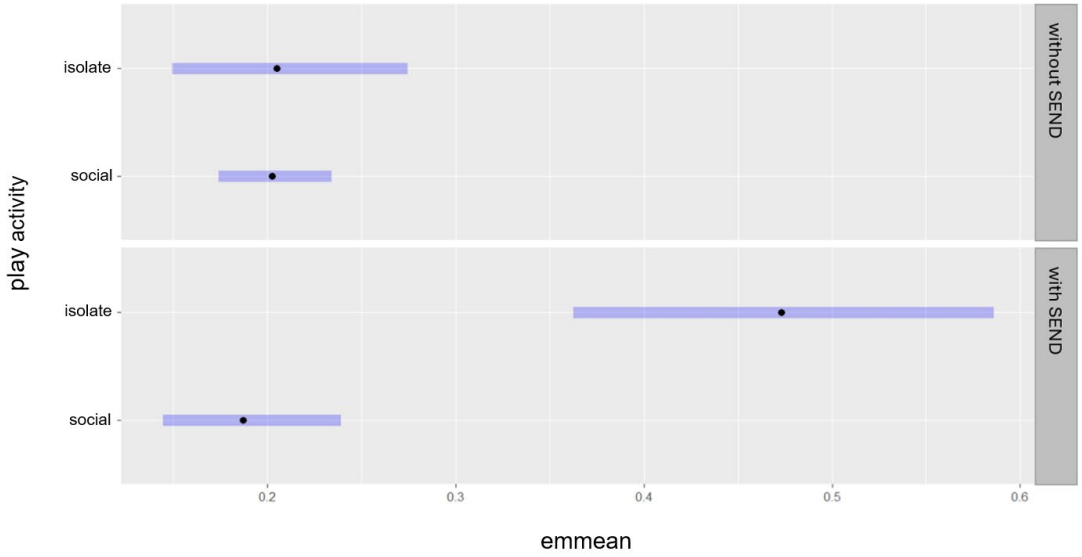

Table 6 | Results of the second GLMM with SEND (yes, no) of the interaction partner (IP) as the dependent variable.

	Chisq	**df**	**Pr(>Chisq)**
Activity	**9.058**	**1**	**.003 ****
SEND of the IP	*2.819*	*1*	*.093.*
Activity x SEND of the IP	**14.311**	**1**	**<.001 *****

Table 7 | Estimated marginal means (EMMs) and 95% confidence intervals (CIs) summarized per group and activity (type = "response"). Confidence level used: 0.95. Intervals are back-transformed from the log scale.

Children without SEND

Activity/toy	**prob**	**SE**	**df**	**lower.CL**	**upper.CL**
social	0.202	0.015	1185	0.174	0.234
isolate	0.205	0.032	1185	0.149	0.274

Children with SEND

Activity/toy	**prob**	**SE**	**df**	**lower.CL**	**upper.CL**
social	0.187	0.024	1185	0.144	0.239
isolate	0.473	0.058	1185	0.362	0.586

Table 8 | Post hoc tests assessing the effect of activity/toy within per group (with/without SEND, type = "response"). P-value adjustment: Sidak method for 2 tests. Tests are performed on the log scale.

Contrast	Children	odds ratio	SE	df	t-ratio	p-value
social-isolate	**without SEND**	0.984	0.213	1185	-0.076	.996
	with SEND	0.256	0.072	1185	-4.833	<.001

4.4. Involvement of teachers

The results of the GLMM analyzing if the activity (*social*, *isolate*) depended on the interaction partner (*teacher*, *child*) and/or initiator of an interaction (*yes*, *no*) are presented in Table 9. The model revealed a significant effect of interaction partner on activity. Our data set shows that children are more frequently involved in teacher-child interactions during isolate activities than during social activities. There was no significant effect of initiator and no significant interaction between initiator of an interaction and activity.

Table 9 | Results of the GLMM with activity as the dependent variable.

	Chisq	df	Pr(>Chisq)
Interaction partner	**164.674**	**1**	**<.001 *****
Initiator	0.748	1	.387
Interaction partner x initiator	0.165	1	.684

5. Discussion

Previous studies have shown that peer interactions in early childhood play a crucial role in children's emotional and academic development (Guedes et al. 2020; Rubin et al. 2011; Valiente et al. 2020). Here, we wanted to assess how different factors such as play activity and interaction partner influence interactions of children with and without SEND. We observed that children with and without SEND did not differ in their time

spent in interactions during free play. However, children with SEND tended to spend less time in interactions with peers and they spent significantly more time in interactions with teachers than children without SEND. Moreover, children with SEND interacted significantly more often in the 'painting/crafting/puzzling' play activity compared to children without SEND. Overall, the probability that children interacted with children with SEND, was quite low. However, for children with SEND this probability increased when they were in isolate activities (classification see for example O'Gorman Hughes and Carter 2002, p. 434). For children without SEND, the type of play activity did not influence their interaction partner.

5.1. Duration of interactions

Our finding that children with SEND tended to be less involved in peer interactions than children without SEND is consistent with previous research (Guralnick et al. 1996, 2006; Odom et al. 2002). Moreover, the finding that children with SEND spent more time interacting with adults than children without SEND aligns with previous studies (Kniel and Kniel 1984). Previous studies have found that children who preferred to interact with adults were more frequently excluded from peer interactions (Odom et al. 2002). Although it is not possible to clearly define cause and effect, our study results show that children with SEND tend to be less involved in peer interactions than their peers without SEND. Being excluded from peer interactions, which are pivotal for many areas of development, is a major risk factor for social-emotional, and cognitive development. This reveals a need for further research and action, which can be taken at various points. In this study, the focus was primarily on the role of play activities.

5.2. Play activities

Setting event interventions that influence behavior by manipulating environmental conditions, are easy to implement, require few staff training, time and are resource efficient (Driscoll and Carter 2004; Odom et al. 1993). Among environmental arrangements, the use of toys that promote social interactions were rated by preschool teachers as significantly more acceptable, feasible, and more often practiced than others (Odom et al. 1993). Therefore, focusing on play activities might be an effective way to support peer interactions. Our data reveal that a significantly higher proportion

of the interactions of children with SEND takes place in isolate play activities such as painting, crafting, or doing puzzles than of children without SEND. This contrasts with previous findings in experimental settings where children with SEND were found to interact more in social toy conditions than in isolate toy conditions (Beckman and Kohl 1984; Kim et al. 2003; Kallam and Rettig 1991). However, the few existing studies conducted in non-experimental settings did not confirm these differences between social and isolate play activities (Driscoll and Carter 2009; O'Gorman Hughes and Carter 2002). While Driscoll and Carter (2009) found only modest intervention effects for two of six children with SEND for the social toy condition, where children showed more social interaction, O'Gorman Hughes and Carter (2002) observed no significant differences between social and isolate toys for the two children with SEND in their study. In our study, children with SEND interacted even more often in "isolate" play activities than in "social" play activities and significantly more often than children without SEND.

The diverging findings from experimental studies and studies conducted in nonexperimental settings might arise due to different factors (Driscoll and Carter 2009). First, many experimental studies are typically conducted in restricted areas that are smaller than the familiar play area of these children, sometimes even in another location (for an overview, see Driscoll and Carter 2009). Secondly, the group size and composition often differs from what is typical in preschools with children with and without SEND (for an overview, see Driscoll and Carter 2009). Related to this, different types and degrees of SEND might also have led to diverging findings (Driscoll and Carter 2009). As another explanation, Driscoll and Carter (2009) have suggested that publication bias may have contributed to the fact that mostly studies with measurable differences between social and isolate toys have been published so far, while they did not observe these effects in their studies. However, due to the small sample size in their own study, Driscoll and Carter (2009) suggested that their findings might not apply to preschool children with SEND in general. But our study on a huge number of children with and without SEND in inclusive day care centers even revealed the opposite: Children with SEND predominantly engaged in interactions within "isolate" activities such as painting, crafting, or doing puzzles, significantly more often than children without SEND. Possibly, children with SEND are overall more engaged in activities such as painting, crafting, or doing puzzles. It would then be logical that

most of their interactions also take place in these activities. However, whether a disproportionately high number of interactions take place in these activities or whether the higher number of interactions in these activities is mainly due to children with SEND spending a particularly large amount of time in these activities would need to be verified with further coding and analyses. Regardless, our data suggest that these activities previously defined as isolate, offer many opportunities for interactions for children with SEND.

5.3. Interaction partners during play activities

While playing in these activities such as painting, crafting, or doing puzzles, children with SEND interacted significantly more with children with SEND than with children without SEND. At first glance, this also might be because children with SEND could generally play more often in these "isolate" play activities. However, children without SEND chose their interaction partners in similar proportions regardless of the play activity, whether social or isolate. A more likely explanation might be that for children with SEND it is easier to interact in play conditions previously defined as "isolate", as these require less complex interaction skills than "social" activities (O'Gorman Hughes and Carter 2002; Ivory and McCollum 1999). For example, it might be simpler to join an activity such as painting or crafting, than initiating an interaction in an ongoing role play with social toys as for example dress-up clothes or housekeeping toys (O'Gorman Hughes and Carter 2002). Strain and Odom (1986) suggested that joining dramatic role play might require specific support for children with SEND due to its complexity.

Overall, it might be useful to group toys or activities not just into isolate or social ones. O'Gorman Hughes and Carter (2002) suggested, that they rather need to be regarded in conjunction with other factors such as toy preference, age, developmental level, social skills, and type of SEND, as well as the interaction partner's characteristics. Painting, crafting, or doing puzzles could be activities that serve as a starting point for developing and expanding interaction skills, especially for children with SEND. Children are constantly developing their interaction strategies at kindergarten age (Corsaro 2013). Thus, play activities previously categorized as "isolate" could be an important learning environment for children with SEND.

5.4. Involvement of teachers

It is crucial to highlight that all activities in our study, including the ones discussed here, were child-led rather than teacher-led. Previous research suggests that teacher-led activities can enhance teacher-child interactions (Wildgruber et al. 2016), while child-led activities tend to foster peer interactions (Booren et al. 2012; Guedes et al. 2020; Kluczniok and Schmidt 2021; Smidt and Embacher 2020; Vitiello et al. 2012). To explore the potential impact of varying levels of teacher involvement based on activity type on our findings, we analyzed the differences in the proportions of teacher-child interactions, peer interactions, and children's initiation behaviors across the various activities. Our results indicate that teachers exhibited greater involvement during isolate activities compared to social activities. However, we found no significant differences in the frequency of child-led initiations, suggesting that children initiated interactions at a similar rate across all play activities. This implies a consistent level of child-led behavior regardless of the activity type. Furthermore, the higher engagement of teachers in isolate activities may reflect the tendencies of children with SEND to engage more in these settings and seek interaction with teachers more than their peers without SEND. Nevertheless, we cannot conclusively establish causality based on our data, but it appears that isolate activities during child-led free play provide meaningful opportunities for interaction, including peer interactions, particularly for children with SEND.

6. Conclusion

Overall, our data of free play interactions in inclusive day care centers confirm previous findings from experimental settings indicating that children with SEND tend to interact less with peers and interact significantly more with teachers compared to children without SEND. To increase peer interactions of children with SEND, the focus on specific play activities might be particularly important and effective. Interventions that influence behavior by manipulating environmental conditions are easy to implement, require few staff training, time, and are resource efficient (Driscoll and Carter 2004; Odom et al. 1993). Among these environmental arrangements, the variation of toys is rated by preschool teachers as the most acceptable, feasible and most frequently used (Odom et al. 1993). Our data suggest the classification of

activities such as painting, crafting, or doing puzzles as isolate, needs to be re-considered as they are the most common activities in interactions of children with SEND and significantly more prevalent than in interactions of children without SEND. We conclude that children with SEND might profit especially from these play activities to develop interaction skills and to increase social participation.

Supplementary Information

The online version of this article (https://doi.org/10.1007/s35834-02500469-6) contains supplementary material, which is available to authorized users.

Author Contributions

MG-K and BH-F contributed to the conceptualization and design of the study. MG-K conducted the investigation and wrote the original draft. MG-K and A-LS performed the formal analysis. MG-K, A-LS, and BH-F were involved in writing, reviewing, and editing of the manuscript. BH-F supervised and provided funding for the investigation. All authors contributed to the article and approved the submitted version.

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Data availability statement

Questionnaires and coding guidelines are available as supplementary material in the online version of this article to authorized users. They will be provided to other users on request. Dataset and R script will also be provided on request.

Declarations

Conflict of interest

M. Goppelt-Kunkel, A.-L. Stroh and B. Hänel-Faulhaber declare that they have no competing interests.

Ethical standards

Ethics approvement: This study was performed in line with the principles of the Declaration of Helsinki.

Consent to participate and to publish: Informed consent was obtained from legal guardians.

Sign learning of hearing children in inclusive day care centers – does iconicity matter?

(Paper 2)

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Abstract

An increasing number of experimental studies suggest that signs and gestures can scaffold vocabulary learning for children with and without special educational needs and/or disabilities (SEND). However, little research has been done on the extent to which iconicity plays a role in sign learning, particularly in inclusive day care centers. This current study investigated the role of iconicity in the sign learning of 145 hearing children (2;1 to 6;3 years) from inclusive day care centers with educators who started using sign-supported speech after a training module. Children's sign use was assessed via a questionnaire completed by their educators. We found that older children were more likely to learn signs with a higher degree of iconicity, whereas the learning of signs by younger children was less affected by iconicity. Children with SEND did not benefit more from iconicity than children without SEND. These results suggest that whether iconicity plays a role in sign learning depends on the age of the children.

Keywords: iconicity · sign language · word learning · special educational needs · disabilities · day care centers · inclusion

1. Introduction

The role of iconicity has gained increasing interest in word-learning processes (for reviews, see Dingemanse et al., 2015; Nielsen and Dingemanse, 2021). Sign languages are produced and received in the visual–spatial modality. For this reason, they can be

used to express iconic aspects of concepts more directly than spoken languages by representing a physical object's shape or handling via hand forms or hand movements (Perniss et al., 2010; Perlman et al., 2018). Therefore, sign language studies provide a promising tool for directly assessing the influence of iconicity on word learning (for a review, see Perniss and Vigliocco, 2014).

A range of experimental studies has demonstrated that signs and gestures can support word learning for children with and without SEND (e.g., Kay-Raining Bird et al., 2000; Nunes, 2008; Lüke and Ritterfeld, 2014). However, there is little research on the role of iconicity in this process in heterogenous groups of children. Therefore, the present study investigated whether iconicity affected sign learning in a large sample of hearing non-signing preschool children in inclusive day care centers. We examined the extent to which characteristics such as age or SEND play a role in this.

1.1. Sensitivity to iconicity

Iconicity is the term used when aspects of linguistic or other communicative forms resemble aspects of the objects, activities or other concepts to which they refer (Perniss and Vigliocco, 2014; Dingemanse et al., 2015). This applies to spoken and signed languages, as well as gestures (Perniss and Vigliocco, 2014). As iconicity and arbitrariness coexist within languages (Lockwood and Dingemanse, 2015), words and signs are not either exclusively iconic or arbitrary, but rather differ in their degree of iconicity.

There is now mounting evidence that iconicity has an effect on lexical learning in different languages and modalities (for reviews on spoken languages, see Lockwood and Dingemanse, 2015, Nielsen and Dingemanse, 2021; for a review on sign languages, see Ortega, 2017). In spoken languages, iconicity includes onomatopoeia, i.e., words representing sounds of animals, vehicles, or other objects, as well as sound symbolism, i.e., phonemes or words that match properties of their referents such as their shape or movement (Ota et al., 2018). Onomatopoeic words are more prevalent in the vocabulary of young children as well as in child-directed speech and are discussed to facilitate vocabulary acquisition (Ota et al., 2018; Laing, 2019; Motamedi et al., 2021). Accordingly, sound symbolism is already perceived and exploited by babies (Peña et al., 2011; Ozturk et al., 2013) and continues to be involved in

vocabulary learning by children of different ages (Maurer et al., 2006; Imai et al., 2008; Massaro and Perlman, 2017; Tzeng et al., 2017). In addition, early acquired words are more likely to be iconic than later acquired words (Perry et al., 2015, 2017; Massaro and Perlman, 2017; Perlman et al., 2017; Sidhu et al., 2021).

Regarding the role of iconicity in sign learning, the results from previous studies are more inconsistent. In sign language, iconicity represents the visual resemblance between aspects of a sign form and its meaning (Nielsen and Dingemanse, 2021). One of the first longitudinal studies on signing babies of deaf parents (aged 0;10 at the beginning to 1;6 years at the end) found that the babies' sign lexicon did not consist predominantly of iconic signs (Orlansky and Bonvillian, 1984). By contrast, recent studies with larger sample sizes of native-signing deaf children (mostly aged less than 3 years) have found that the more iconic the signs were, the more likely they were produced (Caselli and Pyers, 2017 for American Sign Language; Novogrodsky and Meir, 2020 for Israeli Sign Language; Sümer et al., 2017 for Turkish Sign Language with a sample of deaf and hearing native signing children; and Thompson et al., 2012 for British Sign Language) and comprehended (Thompson et al., 2012 for British Sign Language).

Diverging results have also been reported for the interaction between iconicity and age. An analysis of the active and passive vocabulary of native-signing deaf children using British Sign Language revealed that older children (1;9 to 2;6 years) benefit more from iconicity than younger children (0;11 to 1;8 years; Thompson et al., 2012), while another study with a larger sample of native-signing deaf children (0;8 to 2;11 years) measuring sign production in American Sign Language could not replicate this age effect, maybe due to a ceiling effect (Caselli and Pyers, 2017). A study on deaf children using Israeli Sign Language with a wider age band (0;8 to 7;2 years) again observed a different pattern: While the youngest children (0,8 to 2;0 years) only produced signs with the highest degree of iconicity likely, slightly older children (2,1 to 4;6 years) overall produced signs with a higher degree of iconicity more likely than signs with a lower degree of iconicity (Novogrodsky and Meir, 2020). In children older than 4;7 years there was also a ceiling effect making it impossible to draw conclucions on the role of iconicity in this age group (Novogrodsky and Meir, 2020). But an experimental study on deaf children with iconic gestures found that the 3-year-olds (Mean age: 3.67 years) benefited to a similar degree from iconicity as the 4- to 5-year-

olds (Mean age: 5.04 years) in spontaneously mapping and learning iconic gestures (Magid and Pyers, 2017).

Experimental studies with hearing children suggest that hearing children do not benefit significantly from iconicity in signs or gestures until they are somewhat older: Magid and Pyers (2017) found that 4- to 5-year-olds spontaneously mapped iconic gestures to referents above chance whereas hearing 3-year-olds did not. Moreover, the hearing 4- to 5-year-olds relied significantly more on iconicity in learning novel gestures than the hearing 3-year-olds (for similar results see Marentette and Nicoladis, 2011). Based on these observations, Magid and Pyers (2017) suggest that acquiring a sign language, which is rich in iconicity might shift the timepoint when children capitalize on iconicity to an earlier age. This dovetails nicely with the results observed by Tolar et al. (2008) who tested the comprehension of iconic signs in non-signing children. They observed that the 2.5-year-olds mainly guessed, the 3-year-olds predominantly matched iconic signs and their referents correctly, 3.5- and 4-year-olds recognized the meanings more reliably, and the 4.5- to 5-year-olds reached almost adult levels of accuracy. This supports the idea that cognitive development and growing world knowledge allow the children to exploit iconicity with increasing age more effectively for lexical learning (Meier et al., 2008; Marentette and Nicoladis, 2011; Perniss and Vigliocco, 2014; Magid and Pyers, 2017; Ortega, 2017).

Accordingly, in most studies on hearing adult signing beginners, iconicity aids production and recognition of signs in the early stages of learning (e.g., Lieberth and Gamble, 1991; Baus et al., 2013; Ortega et al., 2022; for an overview, see Chen Pichler and Koulidobrova, 2016). Moreover, iconicity seems to speed lexical access in L2 sign language learners (Mott et al., 2020) and it has been shown to facilitate lexical access in deaf native signers when signs and their corresponding pictures overlap (McGarry et al., 2023). It has been suggested that iconic gestures serve as manual cognates for sign-naïve adults at first exposure to iconic signs (Ortega et al., 2020, 2022). Nevertheless, iconic signs with high and low overlap to iconic gestures have been shown to be learned equally successfully by hearing non-signers (Ortega et al., 2020). Hearing adult sign language learners may generelly rely on their experiences with iconic gestures when learning a language in a different modality (Kurz et al., 2023).

1.2. The role of iconicity of gestures and signs in word learning

Gestures and signs have been shown to support word learning in typically developing children (e.g., Ellis Weismer and Hesketh, 1993; Goodwyn et al., 2000; Capone Singleton, 2012; Mumford and Kita, 2014; Vogt and Kauschke, 2017; for second language learning, see Tellier, 2008) and in hearing children with SEND (for an overview, see Toth, 2009), such as specific language impairments (Ellis Weismer and Hesketh, 1993; Vogt and Kauschke, 2017), Down syndrome (e.g., Kay-Raining Bird et al., 2000), or children with autism spectrum disorder who exhibit severely delayed or absent language development (Bonvillian et al., 1981; Goldstein, 2002; Nunes, 2008). This includes both beneficial effects on the learning of spoken words via simultaneously offered signs or gestures and the acquisition of a functional vocabulary with signs when spoken language cannot be acquired or cannot yet be acquired sufficiently (see Luftig, 1982).

One reason why signs or gestures may facilitate word learning is iconicity (e.g., Bonvillian et al., 1981; Lloyd et al., 1985; Kay-Raining Bird et al., 2000; Nunes, 2008; Capone Singleton, 2012; Lüke and Ritterfeld, 2014). It has been speculated that iconicity supports semantic representation (Capone Singleton, 2012; Lüke and Ritterfeld, 2014) and requires less symbolic processing (Bonvillian et al., 1981; Mirenda and Erickson, 2000).

In typically developing children, data by Lüke and Ritterfeld (2014) and Vogt and Kauschke (2017) suggest that iconic gestures may be more effective than arbitrary gestures to support novel word learning. Numerically there seems to be an advantage to recognizing words presented with iconic gestures in contrast to arbitrary ones. However, statistical comparisons were not significant. The two studies had small sample sizes and possibly ceiling effects, thus lacking power (Lüke and Ritterfeld, 2014; Vogt and Kauschke, 2017). For signs of a sign language, some older work reports that typically developing preschoolers learn transparent, i.e., guessable signs (Brown, 1977 in Luftig, 1982) and translucent signs, whose meaning is clear when the relationship is known (Page, 1981 in Luftig, 1982) more easily than less transparent or translucent signs.

Regarding hearing children with SEND, several researchers have suggested that iconicity might be one reason why children with certain special educational needs or

disabilities learn signs or gestures more easily than spoken words (Bonvillian et al., 1981; Lloyd et al., 1985). In one of the first studies (Konstantareas et al., 1978), five school aged children with autism spectrum disorders were shown to learn significantly more iconic signs than arbitrary signs. Furthermore, iconic signs have been reported to represent a large part of the early vocabulary of children with autism spectrum disorders (Bonvillian et al., 1981). Also, children with a complex intellectual disability (ID) have been shown to benefit from sign iconicity in word learning (Griffith and Robinson, 1980 in Griffith et al., 1981 and Luftig, 1982; Lloyd et al., 1985; for a review, see Luftig, 1983). Accordingly, for adults with ID, translucent signs have been shown to be acquired more effectively and to be more functional than other signs (Meuris et al., 2014). Overall, the signed modality does not seem to present any particular disadvantages for adults with cognitive disabilities when compared to neurotypical learners (Joyce et al., 2023).

Gesture research on children with atypical development also sheds light on how children with different special educational needs or disabilities leverage communication in the visual–spatial modality with respect to iconicity. Hearing children with Down syndrome (DS), aged between 3;0 and 8;3 years, have been observed to exhibit a higher frequency of gesture usage compared to typically developing children (Pirchio et al., 2003; Stefanini et al., 2007). Crucially, a greater proportion of these gestures among children with DS are iconic in nature (Pirchio et al., 2003, Stefanini et al., 2007; for an overview, see Capirci et al., 2010). Concerning hearing children with Williams syndrome (WS), there are contradictory findings: Despite some older studies reporting children with WS to use spontaneous gestures less and later than typically developing children (for an overview, see Capirci et al., 2010), a small study in preschool children (3;3–4;3 years) with WS (Pirchio et al., 2003) observed a use of gestures similar to typically developing children. Moreover, school-aged children with WS (9;5–12;9 years) produced more iconic gestures in a picture naming task than typically developing children suggesting that they may compensate word finding difficulties in spoken language via the visual–spatial modality (Bello et al., 2004). Although gesture research on children with autism spectrum disorder has reported that this group of children uses less spontaneous gestures than typically developing children, recent research in school-aged children with autism spectrum disorder (6;11–11;4 years) reveals that these children could

nevertheless benefit from iconic gestures in the recall of spoken language (Dargue et al., 2021). For preschoolers with specific language impairment (SLI), Vogt and Kauschke (2017) observed in an experimental study that they seemed to benefit more from iconic gestures than from deictic ones when learning novel words. To our knowledge, no study has directly compared the natural learning of arbitrary and iconic signs in preschool children with and without SEND.

1.3. The current study

We explored if the degree of iconicity influences the acquisition of signs in a larger sample of hearing non-signing preschool children. Sign learning was assessed with a questionnaire that was filled out by the educators for each child. We also investigated whether age, SEND, or language abilities influence the acquisition of signs. We hypothesized that children would learn more high-iconicity signs than low-iconicity signs. Moreover, we hypothesized that the older children in our sample would learn more iconic signs than the younger ones due to their advanced ability to recognize iconicity. The better benefit from iconicity with increasing age might arise due to growing world knowledge and/or cognitive development enabling children to link iconic aspects of the signs and properties of their referents more successful (Marentette and Nicoladis, 2011; Perniss and Vigliocco, 2014; Magid and Pyers, 2017; Ortega, 2017). Using a larger sample of hearing non-signing children with a fairly wide age range, we wanted to observe the extent to which these effects occur in sign learning in the natural setting of an inclusive day care group. Based on Konstantareas et al. (1978) and Lloyd et al. (1985), we assumed that children with SEND could possibly benefit more from iconicity in sign learning than children without SEND.

2. Materials and Methods

Through in-service training, educators from 25 day care centers learned signs from German Sign Language (German: Deutsche Gebärdensprache, short: DGS). It was decided to offer signs of DGS (rather than gestures) in order to introduce alternative forms of communication into the day care centers. The signs were selected according to the German core and fringe vocabulary (Boenisch and Sachse, 2007) which consists

of nouns, verbs, adjectives, and function words enabling communication (Boenisch, 2013). In total, 232 signs that are often used in daily kindergarten routines were chosen.

These 232 signs were handed out to every day care group printed on cards, each together with a matching symbol (out of the system "METACOM," Kitzinger, 2018) and the German translation (Sterner et al., 2021, see Figure 1).

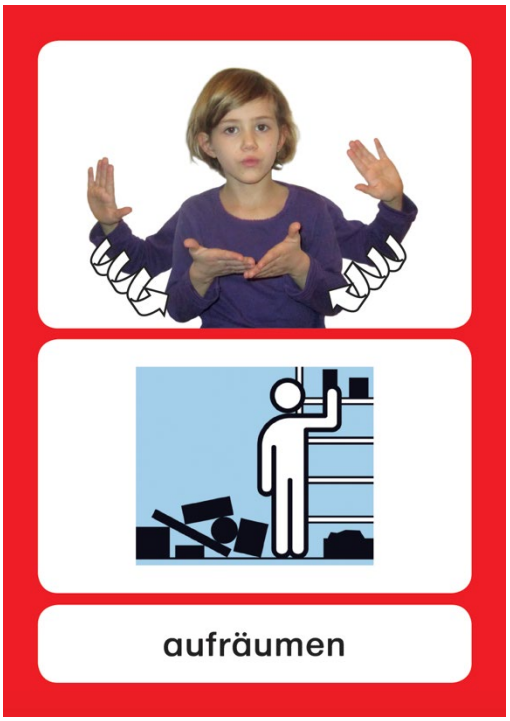


Figure 1 | Card for "to tidy up" (German: "aufräumen") with sign, symbol, and word

The training consisted of a full-day introductory session and eight training sessions, each lasting 2-3 hours, spread over a period of 6 months. The training sessions aimed to reinforce and expand the participants' knowledge of the learned signs. Educators were encouraged to accompany their speech with signs right after the first day of training consistently with all the children in all activities, if possible. But since this study was conducted in a natural setting, the extent to which the children were exposed to input with signs varied, i.e., depending on the children's or the educators' sick leave or the respective play situations.

2.1. Participants

Inclusive day care groups from a large day care provider were randomly selected to participate in the study. In Germany, most of the children are no longer assigned to day care centers according to their disabilities or special educational needs and inclusive day care centers are supposed to care for children irrespective of their need of support. Therefore, the children in our sample differed greatly in their need of support (see Table 1). But no child of our sample was diagnosed to have a permanent hearing loss.

Table 1. Demographic characteristics.

	Age	Sex	Languages
Children without SEND ($n = 112$, percentage: 77.2%)	Mean: 4;2 years Range: 2;1–6;3 years	Boys: $n = 49$ (43.8%) Girls: $n = 63$ (56.3%)	Monolingual: $n = 72$ (64.3%) Bilingual: $n = 40$ (35.7%)
			German acquisition (age): < 24 months: $n = 98$ (87.5%) ≥ 24 months: $n = 14$ (12.5%)
			Languages besides German: Turkish (11), Russian (7), Polish (5), French (4), without specification (3), Albanian (2), English (2), Persian (2), Portuguese (2), Serbian (2), Arabic (1), Dari (1), Dutch (1), Greek (1), Kurdish (1), Moroccan (1), Spanish (1), and Thai (1)
Children with SEND ($n = 33$, percentage: 22.8%)	Mean: 4;8 years Range: 2;4–6;2 years	Boys: $n = 26$ (78.8%) Girls: $n = 7$ (21.2%)	Monolingual: $n = 13$ (39.4%) Bilingual: $n = 20$ (60.6%)
Therapy/assistance: Speech therapy: $n = 27$ (81.8%) Occupational therapy: $n = 13$ (39.4%) Curative education[1]: $n = 6$ (18.9%) Physical therapy: $n = 5$ (15.2%) Without specification: $n = 2$ (6.1%) No therapy/assistance: $n = 2$ (6.1%) Psychological care: $n = 1$ (3.0%) *Of these:* Combined treatments: $n = 16$ (48.5%)			*German acquisition (age):* <24 months: $n = 25$ (75.8%) ≥ 24 months: $n = 8$ (24.2%)
			Languages besides German: Turkish (5), Russian (4), Polish (2), Albanian (1), Dari (1), Farsi (1), French (1), Greek (1), Hindu (1), Slovak (1), Twi (1), without specification (1)

[1]In Germany, curative education is provided to children with mental, physical, social–emotional and linguistic impairments, which includes children with global developmental disorders, but also children with specific support needs due to, for example, sensory disabilities.

Only groups without previous knowledge of signs or sign language were included in order to avoid biases due to already acquired vocabulary at the beginning of the study. In addition, for the present study, only the day care groups with educators who had stated that signing had become an integral part of their work (n = 10) and groups without educator self-assessment but with significantly increased sign vocabulary (n = 3) were analyzed (Schüler et al., 2021; Schüler and Hänel-Faulhaber, 2022). Obviously, when educators do not use that many signs, or no signs at all, as observed in a study by Marshall and Hobsbaum (2015), measurement and assessment of effects is limited (see also Schüler et al., 2021). This resulted in a final sample of 13 day care groups. From these groups, complete questionnaire data from 145 children were available.

Children's language skills were assessed with an integrated questionnaire "Sprachbeurteilung durch Eltern (SBE-3-KT)" (language assessment through parents; Suchodoletz et al., 2011), which is normed for children between 32 and 40 months. The SBE-3-KT is an easy-to-use language screening with high validity and reliability. It is based on speech production with a focus on vocabulary and basic morphosyntax. Within the possible achievable score range of 0–172, the children in our sample scored an average of 136.14 points. The median, however, was 168 points because most of

the children in our sample exceeded the age norm, resulting in a ceiling effect (see Table 2).

Table 2. SBE-3-KT screening scores and results.

SBE-3-KT			*N*	Percentage
Screening score (0–172 achievable points)	Mean: 136.14 points Median: 168 points			
Screening result (per age group)	< 32 months	Negative	1	0.7%
		(Positive*)	(7*)	(4.8%*)
	32–40 months	Negative	12	8.3%
		Positive	7	4.8%
	>40 months	(Negative*)	(88*)	(60.7%*)
		Positive	30	20.7%

Negative results indicate age-appropriate language development, and positive results indicate abnormalities in language development.
*Since the SBE-3-KT is not normed for this age group, this test result cannot be used to determine whether language development is age-appropriate.

2.2. Materials

Six months after the implementation of signs to support communication, educators completed a questionnaire about children's spoken and sign language development (Schüler et al., 2021, see Supplementary Material A). The questionnaire included questions regarding demographic data such as age and sex, language background (monolingual or bilingual), SEND (therapies and/or disabilities), and a language screening via the slightly modified version of the SBE-3-KT (Suchodoletz et al., 2011). The SBE-3-KT consists of a list of 82 words and a grammar section with 15 sentences. We offered the word list also as a sign list and added 12 items that were part of the sign material to include more signs of the training module. In summary, the vocabulary list contained 40 signs that were part of the training module. The educators were asked to indicate which of these items had already been produced by the child more than once. For the scoring and assessment of spoken language skills, only the 82 words of

the original SBE-3-KT were evaluated in order to follow the normed scoring procedure.

For measuring the degree of iconicity in sign acquisition, we evaluated the 40 signs of the questionnaire's vocabulary list that were part of the training material (see Appendix). These signs included 11 nouns, nine verbs, 11 adjectives, and nine signs of other word classes, such as adverbs, pronouns, or prepositions. To assess the iconicity of the signs, we asked hearing university students to rate the iconicity of the 40 signs on a seven-point Likert scale (1 = not iconic at all; 7 = highly iconic), consistent with Vinson et al. (2008, but with deaf native signers) and Caselli et al. (2017). Only participants without knowledge of sign language were included (see Caselli et al., 2017, for a similar procedure for ASL-LEX) to avoid biases due to prior knowledge (Vinson et al., 2008, for BSL). A total of 147 students (mean age: 28;0 years, range: 19–58 years; 109 female, 36 male, 2 diverse) completed the ratings. All participants had normal or corrected-to-normal vision. Overall, nine signs were rated as non-iconic or barely iconic (median degree of iconicity 1 or 2) and nine signs as highly iconic (median degree of iconicity 6 or 7). The remaining 22 signs were assessed to have a median degree of iconicity ranging from 3 to 5. For five signs from our dataset, norms for iconicity are available (Trettenbrein et al., 2021). The mean and median degree of iconicity in our rating is consistent with these values or differs by at most one point (see Appendix).

To assess whether the signed input provided by the educators was biased regarding iconicity, we analyzed video data of the educators and the children during free play in five of the 13 day care groups.

3. Analysis

We used R (version 4.0.2—R Core Team, 2020) and glmmTMB (version 1.0.2.1—Brooks et al., 2017b) to perform a generalized linear mixed-effects analysis with a binomial link function. The dependent variable was sign acquisition, following the children's questionnaire data (acquired = 1, not acquired = 0). As fixed effects, we entered the median degree of iconicity (z-scaled), age (z-scaled), language score (z-

scaled), early versus late acquisition of German language[1] (age of onset of acquisition before versus after the age of 24 months), SEND (yes, no) and the interaction terms of these variables with the variable degree of iconicity. Fixed effects were classified as significant at $p < 0.05$. To minimize Type II errors, we considered $p < 0.1$ as trends.Post hoc comparisons of significant interactions were conducted using approximate t-tests on the estimated marginal means (EMMs) using the R emmeans package (version 1.4.8-1, Lenth, 2023). The confidence level of 0.95 was corrected with the Šidák correction for three estimates (Šidák, 1967). The p-values were adjusted following the procedure proposed by Tukey (1977).

To ensure that collinearity was not a biasing factor, we checked multicollinearity with the R performance package (Version 0.6.1: Lüdecke et al., 2021). For every included variable, there was a variance inflation factor (VIF) under 2.0, which indicates that they were all independent enough from the other variables.

It has been shown that the degree of iconicity of a word or sign can differ depending on its word class (for a crosslinguistic analysis of iconicity by lexical classes, see Perlman et al., 2018). Therefore, we tested to what extent the degree of iconicity differed depending on the word classes of the corresponding word on the sign cards. As our data were not normally distributed according to the Shapiro–Wilk test ($W = 0.92$, $p = 0.009$), we used a nonparametric Kruskal-Wallis test.

In addition, we wanted to examine if the input provided by the educators was a potential confounding factor on children's sign learning regarding iconicity. To this end, we analyzed video data and compared the degree of iconicity of the signs produced by the educators to the median degree of the 40 signs of the sign material. From the video recordings 6 months after implementation, 20 min per child were coded (children were visible on average over 90 percent of the time). Signs used by the educators were recorded each time they were used in interactions with the coded children. Since signs and gestures have areas of overlap (Kendon, 2008; Goldin-Meadow and Brentari, 2017), two hearing advanced signers categorized them following a systematic scheme based on Fricke (2007, 2012) (see Supplementary Material B). Twenty-three out of the total of 111 categorized signs were part of the 40

[1] Based on Schüler and Hänel-Faulhaber (2023), we expected that the age of onset could have a greater impact on sign acquisition and the role of iconicity in this process than bilingualism per se.

signs that had been rated for iconicity by hearing non-signers (see Appendix). As the Shapiro–Wilk test revealed no normal distribution of the median degree of iconicity of the 40 signs of the material ($W = 0.92$, $p < 0.05$) as well as of the 23 signs produced by the educators ($W = 0.87$, $p < 0.05$), a non-parametric Wilcoxon rank sum test was applied to compare their median degree of iconicity in order to check if educators used signs with a higher degree of iconicity more frequently than signs with a lower degree of iconicity.

4. Results

We observed a significant main effect of language score [$\chi(1) = 40.29$, $p < 0.001$, see Table 3 for the full results of the GLMM], suggesting that whether a child learned a sign depended on their spoken language skills. In addition, we observed a significant main effect of age [$\chi(1) = 4.91$, $p = 0.027$]. These effects were already found and analyzed in the previous study with these data by Schüler et al. (2021) revealing that children with better spoken language skills and older children were more likely to learn signs. There were effects of the degree of iconicity [$\chi(1) = 2.85$, $p = 0.092$, see Figure 2] and of early versus late acquisition of German language [$\chi(1) = 3.41$, $p = 0.065$], however, these were only trends.

Figure 2. Percentage of signs acquired by all children in relation to the median degree of iconicity.

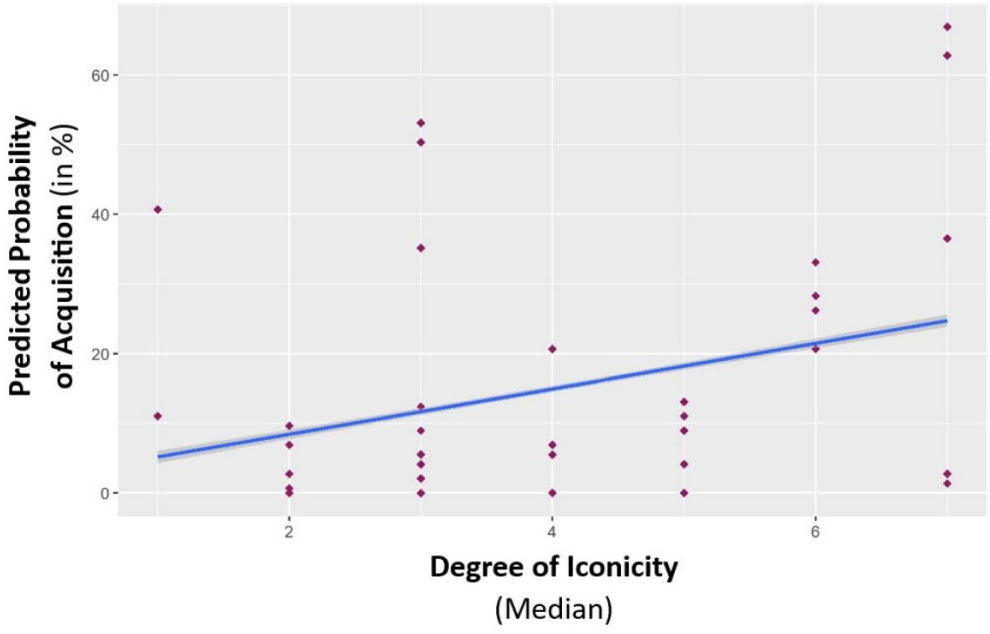


Table 3. Results of the GLMM, with acquisition as the dependent variable.

Effect	Chisq	df	*p* value
Degree of iconicity (z-scaled)	*2.846*	*1*	*0.092*
Age (*z*-scaled)	**4.906**	**1**	**0.027**
Language score (*z*-scaled)	**40.287**	**1**	**<0.001**
Early versus late acquisition of German language	*3.413*	*1*	*0.065*
SEND	0.883	1	0.347
Degree of iconicity × Age	**8.607**	**1**	**0.003**
Degree of iconicity × Language score	1.727	1	0.189
Degree of iconicity × Early versus late acquisition of German language	0.069	1	0.792
Degree of iconicity × SEND	*2.816*	*1*	*0.093*

All continuous variables were *z*-transformed.

There was a significant interaction between the degree of iconicity and age ($\chi = 8.61$, $p = 0.003$). Consistent with our hypotheses, post hoc tests revealed that older children benefitted more from iconicity than younger ones (see Figure 3; Table 4 for EMMs and Table 5 for the post hoc tests). Moreover, there was a marginally significant two-way interaction between the degree of iconicity and SEND. Given that we had a priori hypotheses that children with and without SEND would differ in their gain from iconicity, we compared the slopes for degree of iconicity between the two groups. These comparisons revealed that children without SEND seem to benefit more from iconicity during their sign acquisition than children with SEND ($\beta = 0.194$, $SE = 0.116$, $df = 579$, $t = 1.68$, $p = 0.093$, see Table 6 for EMMs; see Figure 4).

Figure 3. Predicted probability of acquisition in relation to the degree of iconicity (z-scaled)**, grouped by age** (z-scaled)**.**

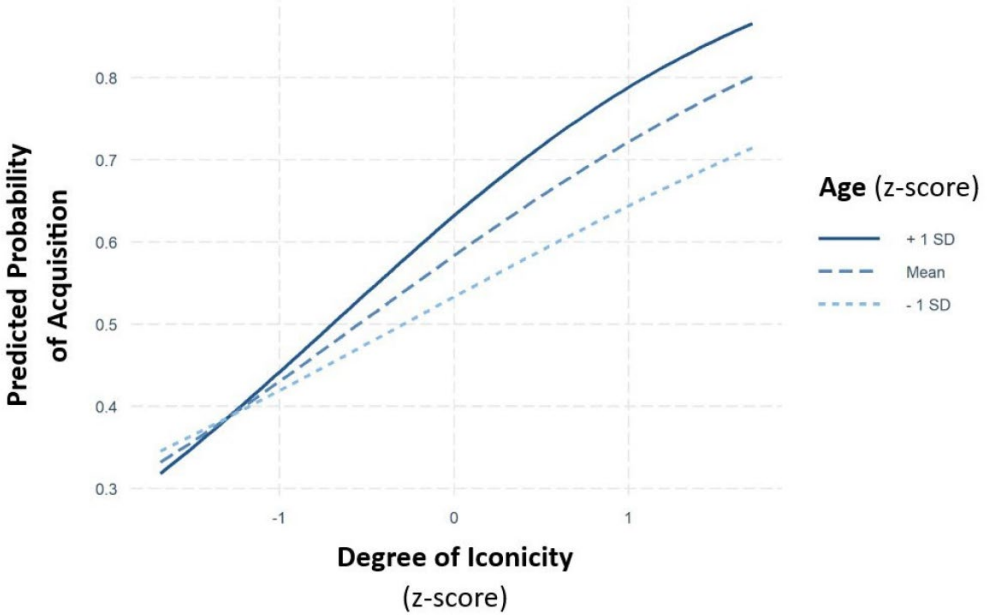


Table 4. EMMs calculating the trend of the variable degree of iconicity for three age groups.

Age	*Degree of iconicity* trend	SE	df	Lower. CL	Upper. CL
− 1 SD	0.389	0.401	5,787	−0.397	1.175
Mean	0.547	0.395	5,787	−0.228	1.321
+ 1 SD	0.704	0.396	5,787	−0.073	1.481

Z-scaled age was grouped into mean, one SD below mean and one SD above mean.

Table 5. Results of the *post hoc* tests assessing the effect of *age* (*z*-scaled) **on the acquisition of signs with a higher *degree of iconicity*** (*z*-scaled)**.**

Contrast	Estimate	SE	df	*t*-ratio	*p* value
−1 SD vs. Mean	−0.158	0.054	5,787	−2.934	0.009
−1 SD vs. +1 SD	−0.315	0.107	5,787	−2.934	0.009
Mean vs. +1 SD	−0.158	0.054	5,787	−2.934	0.009

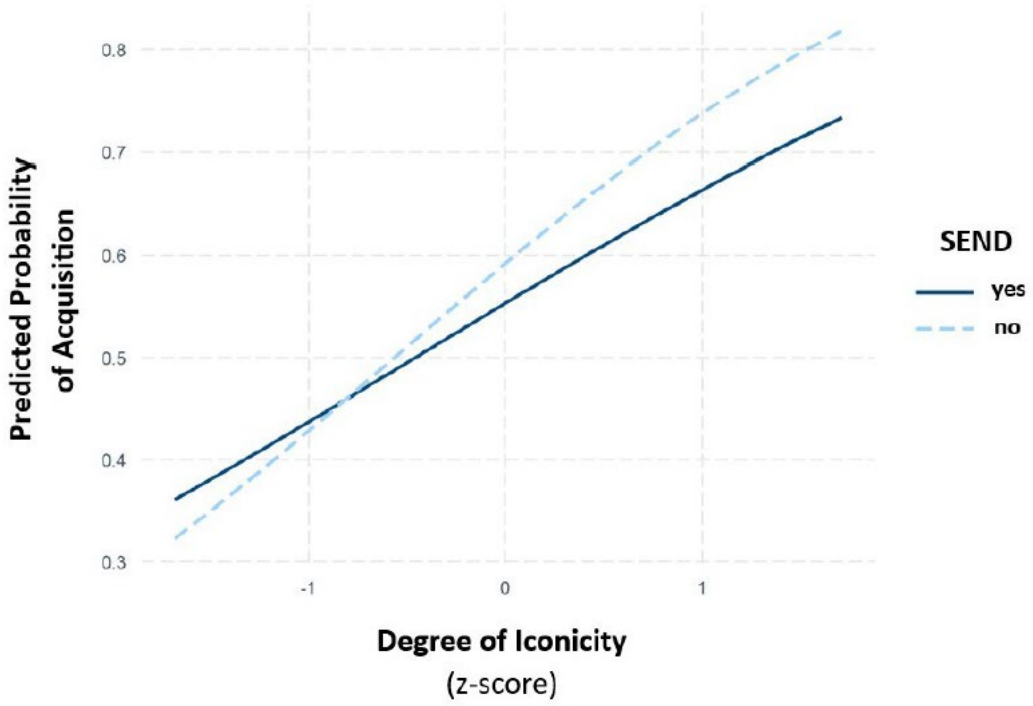
Z-scaled age was grouped as described in Table 4.

We found no interaction between the degree of iconicity and the language score of the children as well as between the degree of iconicity and early versus late acquisition of German language.

Table 6. Trends in the degree of iconicity for children without and with SEND.

SEND	*Degree of iconicity* trend	SE	df	Lower. CL	Upper. CL
No	0.644	0.395	5,787	−0.130	1.417
Yes	0.449	0.404	5,787	−0.342	1.241

Figure 4. Predicted probability of acquisition in relation to the degree of iconicity (z-scaled)**, grouped by SEND.**



The Kruskal-Wallis test revealed no significant differences between the degree of iconicity of different word classes [$\chi 2(2) = 0.883$, $p = 0.830$, $\eta 2 = -0.059$].

The comparison of the degree of iconicity of the educator-produced signs and the signs of the training material revealed no significant differences ($W = 494$, $p = 0.624$). This suggests that the educators did not use significantly more signs with a higher degree of iconicity from the training material.

5. Discussion

In the current study, we investigated the extent to which the iconicity of signs influences children's vocabulary learning in the natural setting of inclusive day care centers. We found that iconicity affected the acquisition of signs, but the strength of this effect depended on the participants' age. Consistent with our prediction, older children learned significantly more signs with a higher degree of iconicity than younger children did. Contrary to previous assumptions, children with SEND in our sample did not benefit more from iconicity than children without SEND.

Our finding that children are more likely to learn signs with a higher degree of iconicity is in line with previous findings of non-signing children's vocabulary in spoken languages, providing further evidence for the notion that children are more likely to learn words with a higher degree of iconicity (Perry et al., 2015, 2017; Perlman et al., 2017; Sidhu et al., 2021). This refers to sound symbolism (Maurer et al., 2006; Imai et al., 2008; Peña et al., 2011; Ozturk et al., 2013; Massaro and Perlman, 2017; Tzeng et al., 2017) as well as to onomatopoeia (Laing, 2019; Motamedi et al., 2021). Furthermore, these results are consistent with most sign vocabulary analyses of deaf children at a comparable age, where iconicity has also been shown to increase the likelihood that signs are part of active vocabulary (Thompson et al., 2012; Caselli and Pyers, 2017, 2020). Thus, it seems that non-signing children are sensitive to iconicity and use it not only in their first language and its modality (e.g., Perry et al., 2015, 2017; Massaro and Perlman, 2017; Perlman et al., 2017; for a review see Nielsen and Dingemanse, 2021) but also in the learning of signs as indicated by some older studies (Brown, 1977 and Page, 1982 in Luftig, 1982). Similar results have also been observed in experimental studies with non-signing children investigating the learning of iconic gestures (Marentette and Nicoladis, 2011; Magid and Pyers, 2017) and the recognition of iconic signs (Tolar et al., 2008). Studies in sign-naïve adults reveal that the implicit knowledge of iconic gestures might facilitate the production of depicting signs (Kurz

et al., 2023) and scaffold the production and recognition of iconic signs (e.g., Ortega et al., 2020, 2022; for an overview, see Chen Pichler and Koulidobrova, 2016). However, after a short practice period, iconic signs with a large or a small overlap with iconic gestures seemed to be learned with similar success (Ortega et al., 2020). Thus, the extent to which this effect might play a role in our long-term study is not clear. Moreover, the effect we found in our study was statistically marginal for the overall group and differed for the various subgroups.

In particular, older children learned more signs with a higher degree of iconicity, whereas younger children did not seem to benefit from iconicity to the same degree. This finding is in line with Thompson et al. (2012), who investigated the role of iconicity in deaf children's acquisition of sign language, with Magid and Pyers (2017) and Marentette and Nicoladis (2011) for the learning of iconic and arbitrary gestures by non-signing children, and Tolar et al. (2008) for the recognition of iconic signs by non-signing children (for similar results with iconic gestures, see Magid and Pyers, 2017). The greater benefit of iconicity for older children has been explained by a developing sensitivity to iconicity with increasing age (e.g., Tolar et al., 2008; Marentette and Nicoladis, 2011; Thompson et al., 2012). Most researchers agree that the cognitive abilities for recognizing and exploiting iconicity in signs become more stable around 3 years of age and continue to increase with age (e.g., Tolar et al., 2008; Thompson et al., 2012; Caselli and Pyers, 2017). It has often been hypothesized that the maturation of various cognitive domains such as spatial cognition, analogical reasoning abilities, or metalinguistic abstraction abilities are important prerequisites for this, but especially experiences seem to play a crucial role (Tolar et al., 2008; Perniss and Vigliocco, 2014; Magid and Pyers, 2017; Karadöller et al., 2022). This also seems to apply to the recognition and exploitation of sound symbolism (e.g., Tzeng et al., 2017). Despite innate mechanisms, also learned mechanisms are required for exploiting iconicity (Fort et al., 2018).

Consistent with Tolar et al. (2008), our data suggest that chronological age seems to be more crucial than language age in a spoken language for the extent to which children capitalize on iconicity in their sign learning. By contrast, when analyzing sign learning independently of iconicity, language age in a spoken language and not chronological age seemed to be the determining factor (Schüler et al., 2021). Accordingly, Joyce et al. (2023) have shown that language-based skills are crucial for sign learning in adults

irrespective of cognitive (dis)abilities. This suggests that language acquisition per se does not require cognitive abilities that are necessary to recognize iconicity. But as soon as these cognitive abilities are developed, iconicity can be exploited and promote sign vocabulary learning. That deaf signing preschool children seem to capitalize on iconicity at a younger age than sign-naïve preschool children when recognizing and learning gestures (Magid and Pyers, 2017) suggests that experiences with a language rich in iconicity may enhance the process of exploiting iconicity. As these age effects are found for signs (Thompson et al., 2012) and gestures (Marentette and Nicoladis, 2011; Magid and Pyers, 2017) an analysis of gestures in inclusive day care groups might have produced similar results. The findings of Marshall and Hobsbaum's (2015) study of word learning in bilingual children whose teachers used speech-accompanying signs or more spontaneous gestures also suggest that signs and gestures may lead to similar effects. Moreover, recent research on hearing and deaf children emphasizes the commonalities of gestures and signs (Capirci et al., 2023).

Previously, it has been suggested that iconicity might be an important factor in why some children with SEND learn signs more easily than spoken words, revealing that children with SEND could have an especially significant gain from iconicity for sign acquisition (Konstantareas et al., 1978; Bonvillian et al., 1981; Lloyd et al., 1985). However, in our study with a heterogenous sample, children with SEND did not seem to benefit more from iconicity than children without SEND. Children with SEND in our sample even seemed to exploit iconicity less or later than children without SEND, but the effect we observed was only a trend. To benefit from iconicity, researchers suggest that not only experiences in the world must be gained, but also the cognitive abilities need to be developed that help to abstract from these experiences and to identify salient features of signs or gestures in order to link referent and linguistic form (Tolar et al., 2008; Perniss and Vigliocco, 2014; Magid and Pyers, 2017). Although it has not yet been conclusively clarified to what extent the development of which cognitive domains and to what extent which experiences play a role in this process, it can be assumed that both cognitive abilities and experiences proceed with increasing age (Magid and Pyers, 2017).

It can be hypothesized that in some children with SEND some cognitive areas relevant for exploiting iconicity may develop slower compared to children without SEND. Indeed, most children with SEND in previous studies (Konstantareas et al., 1978;

Bonvillian et al., 1981; Lloyd et al., 1985; Bello et al., 2004; Stefanini et al., 2007; Dargue et al., 2021) were older than the children with SEND in our study. Based on this, it could be assumed that these older children's abilities to use iconicity were more developed than in our young preschool sample. However, it could also be possible that children with certain diagnoses, which are not present or are too few in numbers for analyses in our sample, might benefit more from iconicity than children without SEND. It should be noted that in our study we considered all children with SEND as one group, regardless of their individual needs. To further analyze how the effects of iconicity possibly differ between children with different special educational needs and/or disabilities, larger sample sizes with homogenous groups of children concerning their diagnoses are needed.

Additionally, in contrast to experimental studies, studies in natural settings have little control over the input that adults provide to children (for spoken language, see Sidhu et al., 2021; for sign language, see Thompson et al., 2012; Caselli and Pyers, 2017; for sign supported communication see Marshall and Hobsbaum, 2015). Studies on hearing adult sign language learners show that they are very sensitive to iconicity, which speeds lexical access (Mott et al., 2020) and that they are more likely to use iconic signs (Lieberth and Gamble, 1991; Baus et al., 2013). By contrast, in child-directed signing, Gappmayr et al. (2022) found iconic signs not to be overrepresented in the signing of deaf and hearing parents toward their deaf children. To assess whether the educators' input regarding the frequency of iconic signs was a biasing factor in our sample, we additionally analyzed video data 6 months after sign implementation in the groups. Comparing the average degree of iconicity of the signs produced by the educators with the average degree of iconicity of the signs in this study, the median value did not differ significantly. Although this observation was made on a small dataset and only on a subset of educators, it seems that the children's sign learning behavior observed in our study regarding iconicity was probably not systematically biased by sign frequency in the educators´ input.

Other factors that may affect sign acquisition besides the degree of iconicity should also be investigated with a larger number of items in more detail, as found in deaf children for frequency, neighborhood density (Caselli and Pyers, 2017), concreteness, babiness (Caselli and Pyers, 2020), and, with diverging results, type of iconicity (Ortega et al., 2017; Caselli and Pyers, 2020).

6. Conclusion

Our results suggest that iconicity affects the learning of signs in inclusive day care settings. This especially applies to older children. The extent to which a group of preschool children with certain special educational needs and/or disabilities may benefit from iconicity, depending on their skills, needs to be explored in larger studies.

Data availability statement

The original contributions presented in the study are publicly available. This data can be found here: https://doi.org/10.25592/uhhfdm.12540.

Ethics statement

The study was performed in accordance with the ethical standards as laid down in the 1964 Declaration of Helsinki and its later amendments of comparable ethical standards, and the project was approved by the Federal Ministry of Education and Research. The informed consent form was reviewed by the Leibniz Institute for Human Development and Educational Information. Written informed consent was obtained from the minors' legal guardian/next of kin for the publication of any potentially identifiable images or data included in this article.

Author contributions

MG-K and BH-F contributed to the conceptualization and design of the study. MG-K conducted the investigation and wrote the original draft. MG-K and A-LS performed the formal analysis. MG-K, A-LS, and BH-F were involved in writing, reviewing, and editing of the manuscript. BH-F supervised and provided funding for the investigation. All authors contributed to the article and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Supplementary material

The Supplementary material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpsyg.2023.1196114/full#supplementary-material

Sign-supported communication in inclusive daycare centers:

The more you need it the more you use it?

(Poster)

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Sign-supported communication in inclusive daycare centers: The more you need it the more you use it?

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Introduction

- Communication impacts language acquisition, cognitive and socio-emotional development [1]
- In inclusive daycare centers, children with communication difficulties tend to be less involved in peer-interactions and less socially accepted [2, 3]
- Experimental studies show positive effects of sign-supported communication (SSC) on word learning and communication skills on children with language impairments [4]
- But little is known about the effects of SSC in natural settings like inclusive daycare groups [5, 6]

Research Questions

(1) Do children *learn* signs trough modeling in inclusive daycare groups?
(2) Do children *use* the signs within peer interactions?
(3) Are there differences in the *learning* and *use* of signs depending on child characteristics like language skills or special educational needs?

Methods

SSC-Training for Educators

- *Duration*: Introduction day and 8 training sessions (2-3 hours each) over 6 months
- *Content*: Signs from German Sign Language (DGS) and their use in everyday routines

Participants and Data Collection

- Questionnaire data from 289 children (age: 19 to 80 months, mean: 51 months). 20,4% of them (n=59) show developmental delays.
- Videodata from 108 children (age: 17 to 78 months, mean: 46 months). 27,8 % of them (n=30) show developmental delays.
- Pre-training, 6 and 18 months post-training

Measurement and Coding

- Language screening and sign learning [7]
- Communicative behavior [8]
- Video coding [a.o. 2, 9]

Results

- ➢ Children can *learn* signs through modeling if the signs are implemented (see figure 1)
- ➢ Children with higher language screening scores *learn* significantly more signs (see figure 1)
- ➢ According to the questionnaire data, children with lower language screening scores are more likely to *use* signs

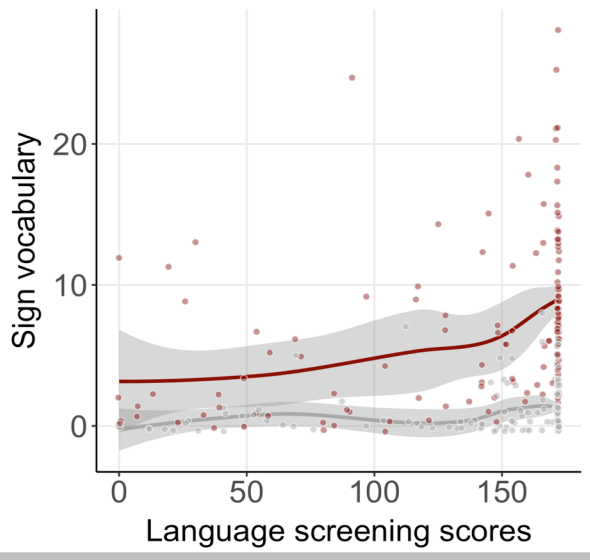

Figure 1: Effect of language screening scores (x) on sign vocabulary (y) grouped by implementation of the signs

- ➢ Within the video data, we observed that within peer interactions children *use* signs almost exclusively if there is a group member with a larger sign than spoken language vocabulary (see figure 2)

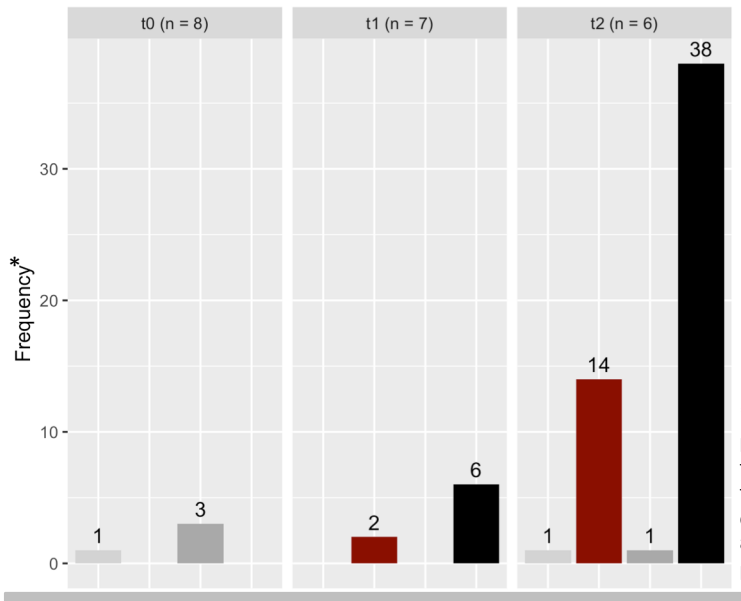

Figure 2: Active signs and gestures of children in the video data of one group with a child with Down syndrome with a larger sign than spoken vocabulary

*within 20 coded minutes per child and measurement time point (children visible to the cameras on average over 90 percent of the time at each measurement time point)

Conclusions

- ➢ Children of different ages and with different expressive language skills *learn* signs through modeling in inclusive daycare groups. Children who made further progress in language development are at a slight advantage
- ➢ The *use* of signs depends mainly on children´s language development level and the language development level of their peers in spoken and signed language
- ➢ These aspects should be considered when implementing sign supported communication in order to use resources in the best possible way for better participation of all children in inclusive day care centers

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Sign learning and its use in a co-enrollment kindergarten setting

(Paper 3)

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Abstract

Experimental studies report positive effects of signing for language acquisition and communication in children with and without language development delays. However, little data are available on natural kindergarten settings. Therefore, our study used questionnaire data to investigate the sign learning in hearing children (aged 3;7–5;9 years) with and without language development delays in an inclusive kindergarten group with a co-enrolled deaf child (aged 3;8 years) and a deaf signing educator. We observed that the hearing children in this co-enrollment group learned more signs than the hearing children from groups with only hearing educators who learned signs in a training program. Hearing children's sign learning showed a tendency toward correlating positively with their level of spoken language development. However, the individual background for children with language development delays impacted this relationship. Additionally, we examined the modality use of all children in interactions with hearing and deaf educators and peers using questionnaire and video data. Despite acquiring signs, hearing children predominantly used spoken language with hearing educators and predominantly nonverbal communication strategies with the deaf educator and the deaf child. Children with language development delays used code-blending with hearing educators in a few cases. The deaf child used mainly sign language for interactions with the deaf educator and mainly nonverbal communication with hearing educators and peers. Overall, our results suggest that the presence of a deaf educator increases sign learning in hearing children. However, in interactions during free play, they barely used signs making it particularly challenging for the deaf child to participate. This reveals that, in addition to a deaf role model, more sign

language competent peers and targeted approaches increasing the use of the visual modality are required.

Keywords: sign language · language learning · co-enrollment · kindergarten · language development delay · deaf

1. Introduction

Communication skills are key to participating in interactions (Guralnick et al., 1996, 2006; Odom et al., 2002). Interactions, in turn, are related to other areas of development, such as social–emotional skills, cognition and language (see DeLuzio and Girolametto, 2011). Deaf children and children with delayed spoken language abilities are at risk of being excluded from interactions (Odom et al., 2002; Preisler et al., 2002). For deaf children, communication in sign language offers the possibility to take part in verbal interactions (Marschark et al., 2006). Moreover, for hearing children with and without language development delays, studies reported that signs or gestures can increase communicative abilities (Bonvillian et al., 1981; DiCarlo et al., 2001). Consequently, the extent to which the visual modality is used by all group members in interactions is particularly crucial for the development of deaf children and children with spoken language development delays. Therefore, our study focuses not only on sign language learning but also on its use in a co-enrollment kindergarten setting with a deaf child and hearing children with and without language development delays.

1.1. Sign learning in deaf and hearing preschool children

Deaf children of deaf parents acquire sign language from their parents as native languages and reach similar milestones at similar ages compared to hearing children acquiring spoken languages (Chen Pichler, 2012). This access to a perceptible language offers age-appropriate language, cognitive, and social–emotional development (Marschark et al., 2006). Besides studies reporting positive effects of signs or gestures on spoken language acquisition in children with various profiles, several studies investigated the extent to which signs are used to communicate by

different target groups. These studies were based on the hypothesis that children could possibly bypass or compensate for certain abilities necessary for spoken language via the visuospatial modality (Bonvillian et al., 1981; Kay-Raining Bird et al., 2000). Already many decades ago, it was suggested that the motoric, visual, and kinesthetic skills in children with autism are more advanced compared to their auditory-verbal ones (O'Connor, 1971). Moreover, for children with Down syndrome, studies have shown that their visual memory is more developed compared to their auditory memory (Kay-Raining Bird and Chapman, 1994). In fact, studies found some children with autism to acquire signs faster than spoken words (for an overview, see Bonvillian et al., 1981; Nunes, 2008). Additionally, children with Down syndrome and typically developing children learned novel words better if the words were presented in parallel with signs than when words or signs were presented separately (Kay-Raining Bird et al., 2000). Producing intelligible spoken language often presents a motor challenge for children with Down syndrome while signing requires less precise fine motor skills (Kay-Raining Bird et al., 2000). Based on this observation, signing is offered to hearing babies and young children to provide another way of communication until fine motor skills are developed (Kay-Raining Bird et al., 2000). Therefore, signs are sometimes offered to children in kindergarten settings but only a few studies on sign learning in hearing children with and without disabilities are available.

A study by DiCarlo et al. (2001) assessed the spoken language development and sign learning in toddlers with and without disabilities (aged 1;3-3;0 years) of two inclusive classrooms in which signs had been implemented in hearing teacher-child interactions. They observed that some signs were learned while the development of spoken language was not inhibited. Wijkamp et al. (2010) investigated the sign learning of children with severe language development delays (aged 2;6–4;7 years) in a setting where Sign Supported Dutch was used by the hearing educational staff and therapists. They found some children to have learned single signs, especially when there was little auditory-vocal communication. A recent larger study by Schüler et al. (2021) investigated the sign learning of children with and without language development delays in inclusive kindergarten groups. The hearing educators in these groups participated in a training program familiarizing them with signs and their use. Six months after implementing the sign training sessions, Schüler et al. (2021) reported a significant increase in the children's sign vocabulary. However, language role

modeling impacted children's sign acquisition significantly: in groups with hearing teachers using many signs, children's vocabulary was significantly larger than in groups where signs were hardly implemented (Schüler et al., 2021). Moreover, sign learning correlated positively with spoken language development: children with better language skills learned significantly more signs than children with lower language skills.

1.2. Sign use in deaf and hearing preschool children in interactions

Concerning interactions, there are studies from different kindergarten settings often focusing on different aspects such as educator–child or peer interactions, children's language profiles, and language modality. Modality is the channel through which language is produced and received, i.e., spoken languages via the auditory-vocal modality and sign languages via the visual-gestural modality (Meier et al., 2009). In kindergarten settings, where only spoken language is used, it is particularly challenging to join interactions for children with language development delays or hearing loss (Guralnick et al., 1996; Odom et al., 2002; Preisler et al., 2002; DeLuzio and Girolametto, 2011). Therefore, some studies investigated the effect of sign use by hearing educators on children's modality use in educator-child interactions. The hearing children with and without disabilities in DiCarlo et al.'s study showed increased communication in both speaking and signing in hearing educator-child interactions (DiCarlo et al., 2001). Wijkamp et al. (2010) observed an increase in the use of gestures or signs in educator-child interactions in some of the children with severe language development delays when they used less spoken language. The children's individual background was driving this effect. Overall, the study observed a large increase in gestures but only a small increase in sign production within hearing educator-child interactions (Wijkamp et al., 2010). Preisler et al. (2002) investigated interactions between deaf children with cochlear implants and their educators in kindergarten settings for deaf and hard of hearing children (DHH) in which speech and signs were used. In these educator–child interactions, speech was used predominantly and often supported by signs. They reported that conveying linguistic content was more difficult when more speech without signs was used. But when the educators ensured eye contact with the children and clearly conveyed the context, the children

understood simple instructions. In contrast, in deaf children with cochlear implants from a kindergarten setting for deaf children with educators using sign language, Preisler et al. (2002) observed extensive and abstract communication in educator–child interactions.

In terms of peer interactions, there are a few more studies available investigating communicative interactions between DHH children, children with language development delays and their typically developing hearing peers. Peer interactions are important for children to learn social skills and are critical contributors to social development (Corsaro, 1997, 2013; Antia et al., 2011). Paying attention to language development delays is particularly important as they were found to be a risk factor for being excluded from peer interactions in the auditory-vocal modality (Guralnick et al., 1996, 2006; Odom et al., 2002). In kindergarten groups with only deaf children where sign language was used, Preisler et al. (2002) reported that deaf children with cochlear implants used sign language at an age-appropriate level in peer interactions. In contrast, for DHH children in an auditory-vocal mainstream setting, DeLuzio and Girolametto (2011) observed consistent with previous studies (Arnold and Tremblay, 1979; Antia et al., 1993; Minnett et al., 1994; Spencer et al., 1994; Brown et al., 2000) that they received fewer interaction requests from hearing peers than their hearing peers and that DHH children's initiation attempts were responded to less frequently by their peers than for hearing children. Overall, many studies report that not only entering in interactions, but also maintaining them is challenging for deaf children in auditory-vocal settings (for an overview see Xie et al., 2014). However, study results differ depending on factors such as the children's and their interlocutor's language ability and mode of communication, their familiarity, or age (see Antia et al., 2011). In preschools for DHH children where spoken language with supporting signs was used, Preisler et al. (2002) found children without sign language competencies to communicate mainly using pointing, gestures, or eye-contact. Similarly, Antia et al. (1993) describe that hearing and DHH children using oral or total communication interact mainly using gestures, exchanging objects, or playing games without verbal communication with each other. Furthermore, children with developmental language disorders (DLD) or hearing loss are reported to communicate more with educators and less with peers in comparison to the age-matched hearing children (Kniel and Kniel, 1984; Odom et al., 2002; Antia et al., 2011). Interacting primarily with educators is

also reported by Preisler et al. (2002) for deaf children attending a mainstream setting with a sign language competent assistant. These deaf children enrolled in mainstream kindergarten groups primarily interacted with the sign language competent assistant. In peer interactions during play, these deaf children were observed to take over only non-communicative roles. However, this study examined a setting with hearing sign language competent assistants that were primarily translating between sign and spoken language, rather than deaf professionals communicating in sign language in all interactions. In addition, due to the study design, most of the data were collected during activities initiated by adults, such as telling stories, but not during free play.

1.3. Modality use in bimodal-bilingual kindergarten settings

In bimodal-bilingual settings, all children are offered sign and spoken language and, thus, two modalities are available for hearing and DHH children to communicate. A study by Schulz (2016) focused exclusively on peer interactions in a bimodal-bilingual preschool group with hearing and DHH children. Although children were reported to use both modalities, most children could be assigned to a specific language group (Schulz, 2016): The hearing children communicated predominantly with other hearing children in spoken language, whereas the DHH children communicated predominantly with other DHH children in sign language. Preferring peers with the same hearing status for interaction is consistent with previous research (e.g., Arnold and Tremblay, 1979; Antia et al., 1993; Minnett et al., 1994; Spencer et al., 1994; for an overview see Antia et al., 2011). Ardito et al. (2008) similarly reported sign language use in deaf and hearing children in a bimodal-bilingual preschool group, where hearing educators used spoken language accompanied with signs and deaf educators used sign language. They suggested that the deaf and hearing children not only showed progress in their literacy development, but also developed better skills in both languages, signed and spoken. To the best of our knowledge, there is no study examining modality use in peer interactions in a bimodal-bilingual setting with both deaf and hearing educators, but with only one deaf child. The question arises how communication is shaped when only one deaf child is present in a bimodal-bilingual setting. Moreover, there is a lack of studies examining sign learning and its use in hearing children with and without language development delays when a deaf educator acts as a sign language role model. A co-enrollment setting of deaf and hearing children, especially including children

with language development delays, offers a unique opportunity to investigate language and communication in all children. But to what extent do children learn and use signs in a setting with a deaf educator and a deaf child? How do factors such as a child's level of spoken language development affect sign learning and its use in interactions during free play? Free play is an important setting for the participation in social peer interactions which are essential during child development (Corsaro, 1997). However, there is hardly any data available so far for learning settings of social and cultural processes (Corsaro, 2013) in a co-enrollment setting with a deaf child.

Therefore, our study used questionnaire and video data to examine the sign learning and use of children in an inclusive kindergarten group into which a deaf child was co-enrolled simultaneously with a deaf educator six months before data collection, so that a bimodal-bilingual setting was established. In this study, a bimodal-bilingual setting refers to an environment in which at least one deaf educator communicates with all children in sign language while at least one hearing educator communicates in spoken language, accompanied in part by signs. The children in our sample are supervised by one deaf educator and several hearing educators. Our data will be directly contrasted with data from inclusive kindergarten groups with hearing educators of Schüler et al. (2021). This comparison of sign learning in children with and without language development delays under different input conditions allows for a more extended assessment of role modeling as an influential factor on children's sign learning. Following Schüler et al. (2021), we also investigated the correlation between hearing children's spoken language abilities and their sign learning. In addition, the data are analyzed to determine the use of different modalities in interactions during free play in order to assess which participation opportunities such a co-enrollment setting offers to children with different language learning prerequisites.

2. Materials and Methods

2.1. Participants

In total, 12 children (seven boys and five girls) from a co-enrollment kindergarten group participated in this study (for detailed participant background information, see Table 1 in the results section). Eleven children were hearing (age range = 3;7–5;9 years, M age = 4;5 years). Eight of them were monolingual native German speakers

while three were bilingual with German as one of their languages. One child (age = 3;8 years) was a third generation deaf native signer acquiring German Sign Language (DGS) from birth from her deaf parents. All children included in the study had been attending the group for at least six months with the deaf child being co-enrolled in the group exactly six months ago. At that time, a deaf signing educator exposed to signs since the age of six years and using DGS as primary mode of communication since the age of 12 years, was employed in the group in parallel. Three hearing children received at least one kind of therapy like speech therapy, ergotherapy or physical therapy, but mostly in combination. Of these three children, one child was diagnosed with epilepsy affecting the speech center, one child had been described as having three detected genetic defects influencing cognitive and motoric development and one child had no diagnosed disability but showed a language delay in German and received ergotherapy. Additional six children of the same preschool group were excluded from the study due to enrollment of less than six months prior to data collection (n = 5) or with complex disabilities preventing the acquisition of sign or spoken language (n = 1). Participants' legal guardians provided written informed consent prior to participation in the study.

2.2. Materials

In this study, we used the combination of questionnaire and video recordings to tackle our research question. The questionnaire was answered by both parents and educators and comprised four different sections with demographic information being provided at the beginning of the questionnaire prior to the sections (see Supplementary Material A for the educator questionnaire). The first section assessed vocabulary knowledge in sign and spoken language by presenting parents and educators with a list of 94 words and signs and ask them to mark each word and sign that the child is actively producing as a word and as a sign separately. This list contained 82 items extracted from the German language screening test SBE-3-KT (Suchodoletz et al., 2011) and an additional set of 12 signs and their corresponding translation equivalents from Schüler et al. (2021) often used in kindergarten communication settings and, thus, allowing for a direct comparison of both studies. The second section included 15 items from the grammar section of the SBE-3-KT test to measure children's language developmental status more extensively. The next section collected information on the use of modalities in interactions with educators and peers overall to analyze children's

pragmatic-communicative skills. These questions were adapted from the Pragmatic Profile by Dohmen (2009) with sign and sign language as additional response options. Finally, the last section required the rating of each child's speech intelligibility and comprehension on a scale of 0–100 in full numbers to better assess their abilities in spoken communication.

In addition, video data were collected during free play sessions in order to analyze language and modality use during interactions. A total of 13 cameras were installed in the rooms so that the children's interactions could be recorded in all areas as far as possible. One hour of free play was filmed for each of the two survey days per child.

3. Analysis

3.1. Questionnaire data

The spoken vocabulary and grammar part was evaluated following the given procedure of the SBE-3-KT (Suchodoletz et al., 2011). We evaluated only the questionnaires completed by the educators as these are considered more reliable than the parents' questionnaires because the educators are more familiar with the signs presented in the questionnaire and their answers are more closely related to the kindergarten setting. For each child, a sign score and an SBE-3-KT score was calculated. For the sign score, each sign of the list presented in section one of the questionnaire marked as used by the child more than once was assigned one point leading to a maximum score of 94. In the evaluation of the spoken language part, a total of up to 172 points could be achieved.

First, we compared the sign score of the 11 hearing children from our co-enrollment group with the data of Schüler et al. (2021) using similar materials. They analyzed the sign learning of 289 children from inclusive kindergarten groups with only hearing educators who were trained in using signs six months prior to data collection. The children were divided into two groups based on implementation strength: One group consisted of 145 children (age range = 2;1–6;3 years, M age = 4;4 years), whose educators used signs frequently, i.e., high implementation strength. The other group comprised 144 children (age range = 1;7–6;6 years, M age = 4;4 years), whose hearing educators used signs rarely, i.e., low implementation strength (for a detailed description of the participants demographic data see Supplementary Material B). As

the Shapiro–Wilk test revealed no normal distribution of the data ($W = 0.76$, $p < 0.001$), we used a nonparametric Kruskal–Wallis to test for the effect of group. A post hoc Wilcoxon rank-sum test with the Holm method for value of p adjustment (Holm, 1979) was applied to compare the sign score of our co-enrollment group to the two implementation groups of Schüler et al. (2021). In parallel to Schüler et al. (2021), we investigated the correlation between the sign score and the SBE-3-KT score. For this purpose, we calculated the non-parametric Kendall's rank correlation τ for all 11 hearing children displayed in a scatterplot in the results section.

Regarding the pragmatic profile, we only evaluated the four questions that concern the children's active use of a modality during interactions to get an impression of children's modality use over time from the educator's perspective. The first three questions relate to educator-child interactions and the fourth question relates to peer interactions (for details, see the Supplementary Material A).

3.2. Video data

The video data were coded with respect to language use and interactions motivated by Preisler et al. (2002) and Schulz (2016) (see Supplementary Material C for further information on the coding scheme). Of all video data, 30 min of each child were coded from two survey days resulting in a total of 60 min of coded free play per child. All children were present on the same two survey days, except for children 9, 10, and 11. As child 10 and 11 were not present on one of these survey days, videos from another day were coded for these children. Child 9 was not present on this other day; thus, the child was excluded from the video analysis.

For each interaction, children's interaction partners were determined, and modalities used by the children and their interaction partners were coded including spoken language, sign language, code-blending, code-switching, and nonverbal communication strategies such as pointing, nodding, head shaking, laughing, giving or taking objects. Nonverbal communication was only selected when no lexicalized words or signs occurred within the coded interaction and, thus, none of the other categories applied. Code-blending was selected when spoken words and signs were produced simultaneously, even if this happened only once within an interaction. In contrast, code-switching was assigned if a child switched from spoken language to sign language or vice versa. The videos were coded by two student assistants who are

hearing advanced signers and had previously been trained in a similar coding scheme during a previous project (Goppelt-Kunkel et al., 2021). To determine consistency during coding, a reliability analysis was performed on 20% of the data from five randomly selected children, including the deaf child, using Cohen's Kappa (Cohen, 1960). Coders show substantial agreement for coding used modalities ($\kappa = 0.74$, 95% CI [0.55, 0.94]).

4. Results

4.1. Sign score and SBE-3-KT score

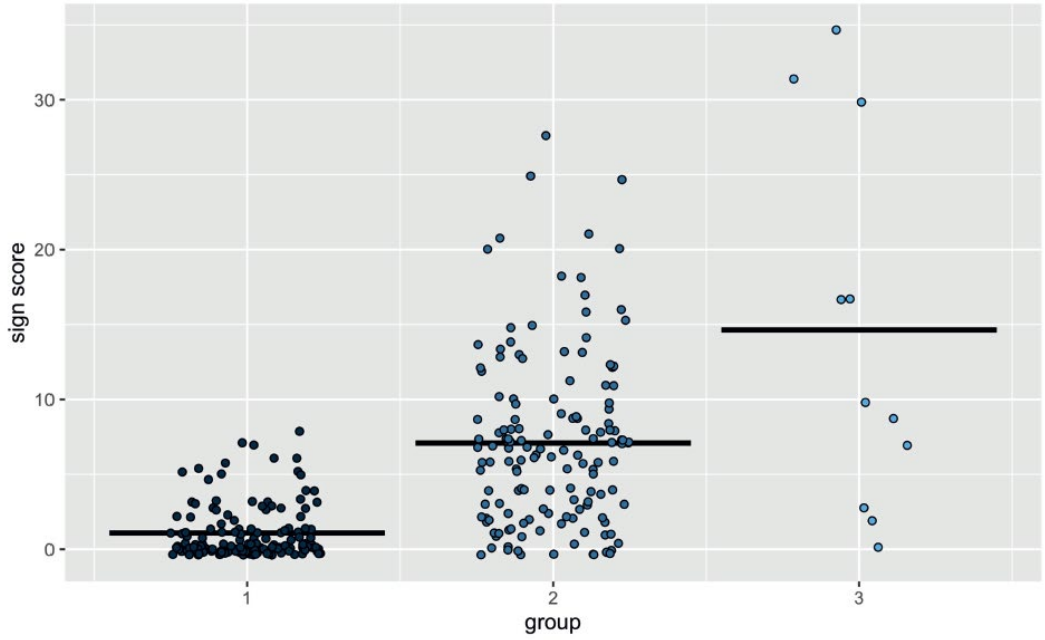
Table 1 below presents an overview of the sign score and the SBE-3-KT score as well as additional demographic information for each child in the co-enrollment group.

Table 1. Demographic data, SBE-3-KT-score and sign score of the children sorted by hearing level, age of German acquisition and speech therapy.

Child no.	Gender	Age in months	Individual background	Therapy	Language	SBE-3-KT score (max. 172)	Sign score (max. 94)	Speech intelligibility in %	Speech comprehension in %
Hearing children without speech therapy and German acquisition from birth									
1	M	44	–	–	German, Polish	118	2	60	70
2	F	45	–	–	German	153	17	75	90
3	M	50	–	–	German	172	9	90	100
4	F	52	–	–	German	172	30	100	100
5	M	54	–	Ergotherapy	German, Arabic	39	3	30	30
6	M	55	–	–	German	171	10	100	100
7	M	57	–	–	German	172	7	100	90
8	F	64	–	–	German	172	31	100	100
Hearing child without speech therapy and successive acquisition of German									
9	M	53	–	–	Croatian, English, German (starting at 3 months)	124	35	75	80
Hearing children with speech therapy									
10	F	43	Epilepsy (caused by FCD or ganglioglioma), speech center affected	Speech therapy, ergotherapy	German	6	17	50	90
11	M	69	Three detected genetic defects	Speech therapy, ergotherapy, physical therapy	German	144	0	70	70
Deaf child									
12	F	44	Sensory-neural deafness	Speech therapy, ergotherapy	DGS, German	–	93	10	0

First, we assessed sign learning in the hearing children across all groups, i.e., in the co-enrollment group and the two implementation groups from Schüler et al. (2021) showing a main effect for group [$\chi 2(2) = 130.51$, $p < 0.001$, $\eta 2 = 0.43$]. Follow-up tests comparing the low implementation group, i.e., group 1 (sign score M = 1.09), and the high implementation group, i.e., group 2 (sign score M = 7.09), each with our co-enrollment group, i.e., group 3 (sign score M = 14.64), revealed significant differences. The average sign score of the hearing children in the co-enrollment group was significantly higher than in implementation group 1 ($p < 0.001$, $d = 0.39$) and implementation group 2 ($p = 0.05$, $d = 0.16$) from Schüler et al. (2021) as shown in Figure 1.

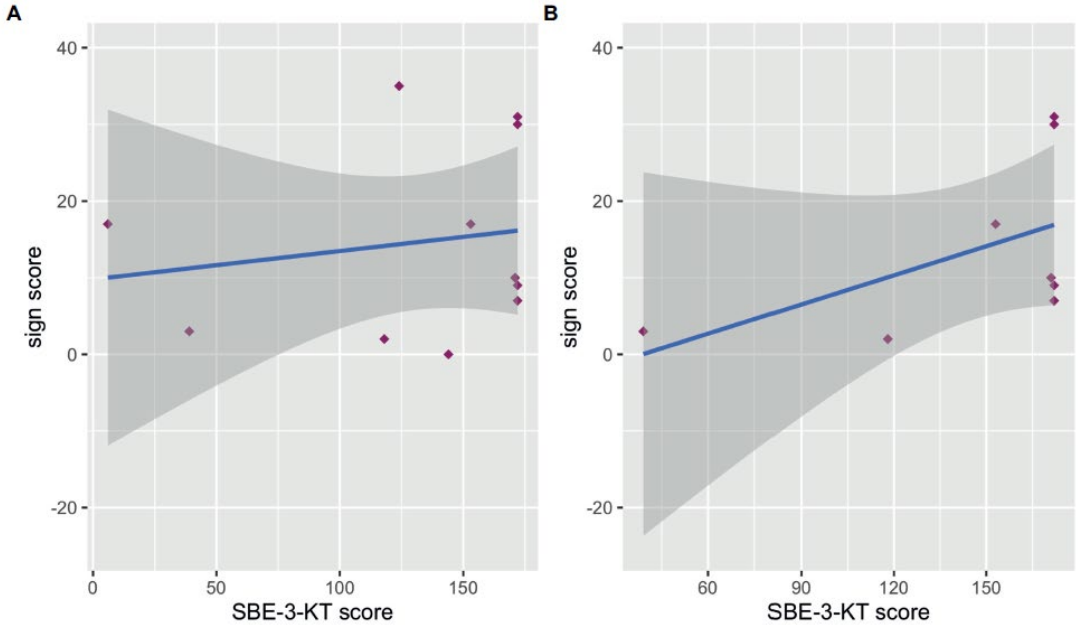
Figure 1. Sign score for hearing children by groups with (1) the inclusive kindergarten groups with low implementation of signs from Schüler et al. (2021), (2) the inclusive kindergarten groups with high implementation of signs from Schüler et al. (2021) and (3) the co-enrollment group with a deaf child and a deaf educator.



Next, we analyzed the relationship between the sign score and the level of language development in spoken language in the hearing children of our co-enrollment group. Children's sign score and SBE-3-KT score correlated weakly for the hearing children ($r\tau = 0.117$, $p = 0.630$) but did not reach statistical significance. The data visualization in Figure 2A suggested that the two children undergoing speech therapy and the one child that did not acquire German from birth showed diverging patterns in the relationship between sign score and language development level. Therefore, we

excluded these three children and repeated the correlation analysis (Figure 2B). When only including children, who learned German from birth and who did not show a language development delay (n = 8), the correlational coefficient increased to medium ($r\tau$ = 0.403, p = 0.184) but still the correlation did not reach significance even if a tendency toward significance can be observed. The lack of significance might be due to the very small sample size of our group and, thus, with a larger more homogenous sample significance might be reached. Nevertheless, the observed direction of the correlation in our data is consistent with Schüler et al. (2021) showing higher sign learning for children with advanced spoken language skills. Thus, irrespective of the tested group, a higher SBE-3-KT score seems to condition a higher sign score.

Figure 2. Correlation between sign score and SBE-3-KT-score for the co-enrollment group for (A) all hearing children and (B) only hearing children acquiring German from birth and without speech therapy.



4.2. Pragmatic profile

In educator-child interactions, hearing children without speech therapy and acquiring German from birth were all reported to use spoken language in complete sentences with some exceptions of single words, two-word sentences, or other modalities (for a summary presentation of the data, see Table 2). Child 4 additionally used sign language in one of the three queried situations. Child 5 did not use full sentences, but single

words, two-word combinations or nonverbal communication strategies. Child 7 used, depending on the situation, complete sentences, single words or two-word combinations, signs, or used no language, but reacted emotionally with crying or anger. The two hearing children undergoing speech therapy used diverging modalities for communication: Child 10 used nonverbal communication strategies, reacted with emotions, used single signs, or single words depending on the communication context. Child 11 used single words or pointed to a desired object. The deaf child used sign language.

Table 2. Active use of modalities and communication strategies for each child in interactions with educators as indicated in the respective section of the educator questionnaire.

Child	Spoken language	Sign language	Spoken language and sign language	Nonverbal communication (e.g., mimic or gestures)	Emotional/passive reaction (e.g., crying)
Child 1	+	–	–	+	–
Child 2	+	–	–	–	–
Child 3	+	–	–	–	–
Child 4	+	+	–	+	–
Child 5	+	–	–	+	–
Child 6	+	–	–	+	–
Child 7	+	+	–	+	+
Child 8	+	–	–	+	–
Child 9	+	–	–	+	–
Child 10	+	+	–	+	+
Child 11	+	–	–	+	–
Child 12	–	+	–	–	–

A "+" indicates that the modality was selected for the child for at least one question.

For participating in peer interactions, hearing children without speech therapy and acquiring German from birth were all reported to use spoken language (for a summary presentation of the data, see Table 3). Additionally, child 8 used a combination of words and signs and child 4 played next to other children without communicating with them. Child 9 that did not learn German from birth also communicated in spoken language in peer interactions. Child 10 who was undergoing speech therapy due to epilepsy used a combination of words and signs for peer interactions or played parallel to other children without communicating with them. Child 11 who was undergoing speech therapy due to genetic defects used spoken language for peer interactions or played by himself, thus without communicating with other children. The deaf child was reported to use indistinct spoken language toward peers for playing and to need help by educators to join peer interactions.

Table 3. Active use of modalities and communication strategies for each child in peer interactions.

Child	Spoken language	Sign language	Spoken and sign language	Playing alone	Playing alongside the other children	Watching the other children	Need of adult guidance
Child 1	+	–	–	–	–	–	–
Child 2	+	–	–	–	–	–	–
Child 3	+	–	–	–	–	–	–
Child 4	+	–	–	–	+	–	–
Child 5	+	–	–	–	–	–	–
Child 6	+	–	–	–	–	–	–
Child 7	+	–	–	–	–	–	–
Child 8	+	–	+	–	–	–	–
Child 9	+	–	–	–	–	–	–
Child 10	–	–	+	–	+	–	–
Child 11	+	–	–	+	–	–	–
Child 12	+	–	–	–	–	–	+

A "+" indicates that the modality was selected for the child for at least one question.

4.3. Video data

Overall, 1,254 interactions of all 11 children were coded with 193 educator-child interactions (15.4%) and 1,061 peer interactions (84.6%). Table 4 below provides an overview of all interactions separated by used modality and interaction partner.

Table 4. Occurrences of language modalities as percentages with absolute numbers in parentheses used by the hearing children and the deaf child when interacting with hearing educators, the deaf educator, hearing peers or the deaf peer in the video data.

Interactions	Spoken language	Nonverbal communication	Code-blending	Code-switching	Sign language	Total
Hearing children						*93.2%*
						(1169)
Hearing educator	54.3%	42.2%	3.4%	0%	0%	9.9%
	(63)	(49)	(4)	(0)	(0)	(116)
Deaf educator	23.1%	76.9%	0%	0%	0%	1.1%
	(3)	(10)	(0)	(0)	(0)	(13)
Hearing peer	72.4%	27.4%	0.2%	0%	0%	87.7%
	(742)	(281)	(2)	(0)	(0)	(1025)
Deaf peer	13.3%	80.0%	0%	0%	6.7%	1.3%
	(2)	(12)	(0)	(0)	(1)	(15)
Deaf child						*6.8%*
						(85)
Hearing educator	4.3%	43.5%	8.7%	8.7%	34.8%	27.1%
	(1)	(10)	(2)	(2)	(8)	(23)
Deaf educator	0%	36.6%	0%	0%	63.4%	48.2%
	(0)	(15)	(0)	(0)	(26)	(41)
Hearing peer	14.3%	66.7%	0%	0%	19.0%	24.7%
	(3)	(14)	(0)	(0)	(4)	(21)

Hearing children were involved in 1,169 interactions and mostly interacted with their peers and less with the educators except for child 10, who was undergoing speech therapy. In interactions with hearing educators, the hearing children primarily used spoken language followed by nonverbal communication strategies and rarely code-blending. However, the two hearing children undergoing speech therapy, children 10 and 11, mainly used nonverbal communication strategies with their educators followed by spoken language. The four code-blending interactions were all observed in children with delayed spoken language development in German toward hearing educators, two in child 10, one in child 11 and one in child 5. When communicating with the deaf educator, the hearing children relied on nonverbal communication strategies but less on spoken language. In peer interactions, hearing children used predominantly spoken language followed by nonverbal communication strategies. In contrast, the children undergoing speech therapy mainly used nonverbal communication strategies for peer interactions but also spoken language. Code-blending and sign language were only applied in a few cases by hearing children while code-switching was not observed. The two peer-interactions with code-blending were observed in two hearing children without disabilities, child 7 and 8, both with child 4 without disabilities. The only observed interaction in which sign language was used by a hearing child was detected in child 5 when communicating with the deaf child.

The deaf child participated in 85 interactions predominantly with the educators and comparatively less with her peers. Communicating with educators, the deaf child predominantly interacted with the deaf educator mostly using sign language and, in fewer cases, nonverbal communication strategies. In contrast, interactions with the hearing educators were much less and the pattern of used modalities was reversed with additional observed modalities. The deaf child primarily used nonverbal communication strategies and sign language whereas spoken language, code-blending, and code-switching were only used in a few interactions. In interactions with her hearing peers, the deaf child applied mostly nonverbal communication strategies but also used sign language and spoken language.

5. Discussion

In our study, we investigated sign learning in hearing children and language modality use of hearing children and a deaf child in a co-enrollment kindergarten setting. The deaf child was co-enrolled six months before data collection in parallel with a deaf educator. We observed that hearing children in the co-enrollment setting had learned significantly more signs than children from inclusive day care centers whose hearing educators had learned signs in a training program (Schüler et al., 2021). Children with more advanced spoken language skills demonstrate a tendency to higher sign scores except for children with certain individual backgrounds or later acquisition of German, although this observation did not reach significance possibly due to the small sample size. In interactions during free play, however, hearing children used predominantly spoken language. The deaf child used predominantly sign language with the deaf educator and predominantly nonverbal communication strategies with hearing educators and her peers. Code-blending was observed only occasionally, mostly by children with language development delays when communicating with hearing educators. Code-switching, on the other hand, was observed sporadically only in the deaf child when communicating with hearing educators.

5.1. Sign learning

The analysis of sign learning revealed that the hearing children in our co-enrollment group with a deaf educator learned signs. Compared with data from children of inclusive day care groups with sign-trained hearing educators (Schüler et al., 2021) children in our co-enrollment group showed a significantly higher sign score. This difference seems not to arise due to different language development levels of the children, since the children from Schüler et al.'s groups with low sign scores showed the highest spoken language skills whereas the hearing children from the co-enrollment group showed the lowest spoken language skills. The major difference between our co-enrollment group and Schüler et al.'s groups is the presence of a deaf educator. The deaf educator and the deaf child are communicating predominantly using sign language, and, therefore, the co-enrollment group is exposed to the signed modality more extensively presumably leading to increased sign learning. This suggests that hearing children might learn more signs due to deaf role models.

However, we cannot exclude previous occasional sign contact since the deaf child attended another group of this kindergarten before enrollment in the observed group and another deaf child in a different group attended the kindergarten two years ago. But, comparing the sign score of the co-enrollment group with the sign score of the children in the groups of hearing sign trained educators after 18 months of exposure in the data of Schüler and Hänel-Faulhaber (n.d.) suggests that even with prolonged contact with signs by hearing educators children seem to learn less signs as when a deaf role model is present.

Furthermore, we observed that hearing children's sign learning showed a tendency to correlate positively with their spoken language abilities. However, this relation does not become significant in our data. Nevertheless, applying the analysis to a more homogeneous group by excluding children with language development delays and onset of German acquisition later than birth, the relation increases. The general tendency of this relation is in line with Schüler et al. (2021) who show that children with more advanced spoken language skills learned more signs than children with less advanced spoken language skills. The lack of significance might be due to the small sample size or the used test to assess the spoken language abilities as all hearing children are almost at ceiling. The SBE-3-KT was selected to compare our data with the data of Schüler et al. (2021), but for a more accurate calculation of the correlation between sign learning and spoken language abilities tests normed for the investigated age group are required. Nevertheless, this correlation is also reported for unimodal bilingual preschool settings and explained by increasing abilities to process language (cf., Wode, 2009). However, in our small and heterogenous sample, we observed children with different patterns: The child with epilepsy, whose speech center was affected, had learned more signs than all other hearing children on average despite the lowest score in the spoken language test. This suggests that the child was able to use unaffected brain areas for language via the visual modality. This is supported by similar observations in children with Down syndrome (Kay-Raining Bird and Chapman, 1994; Kay-Raining Bird et al., 2000) and with autism spectrum disorders (O'Connor, 1971). Thus, a visual language provided the opportunity for more and improved communication with implications for other areas of development such as social–emotional and cognitive skills. However, the other child undergoing speech therapy did learn no sign from the tested list. This reveals that sign learning may depend on

the individual background of a child with language development delay. The one child that did not learn German from birth and showed no age-appropriate language skills in German, had learned most signs of the tested list. Therefore, we assume that this child also benefited in a special way from the visual modality. It might be the case that the visual modality offered the opportunity to see aspects of the referents represented iconically (Lüke and Ritterfeld, 2014; Vogt and Kauschke, 2017). However, the other bilingual children with delayed language development in German learned fewer signs than all other hearing children in the co-enrollment group. This suggests that only some bilingual children show a preference for learning signs which might be driven by the age of acquisition of the national language as found by Schüler and Hänel-Faulhaber (n.d.). However, the child with successive acquisition of German of our co-enrollment group started to acquire German at the young age of three months, thus, being exposed to three languages or other factors might have been more crucial for his high sign score. Overall, our co-enrollment group's heterogeneity provided the opportunity to observe different patterns of sign learning and modality use, but our findings need to be investigated in more depth in future studies with a larger and more controlled group of children.

5.2. Modality use in interactions

Despite acquiring signs, hearing children in our study rarely used the visual modality in interactions and mostly interacted in spoken language instead. This finding is consistent with research from inclusive kindergarten groups whose educators were trained to use signs in interactions with children (Goppelt-Kunkel et al., 2021). Similar findings were reported from monomodal-bilingual kindergarten settings showing that children mostly communicate in the national language unless there is a need to use the second language offered (cf., Wode, 2009).

In interactions with educators, two hearing children without disabilities sometimes used signs according to the questionnaire data, but in the video data sign use toward educators by hearing children was observed only for hearing children with language development delays: They sporadically used code blending in interactions with a hearing educator. Furthermore, in interactions with hearing educators, hearing children predominantly used spoken language. This finding is not surprising, as spoken language is the national language and the main mode of communication for both. In

contrast, when communicating with the deaf educator, hearing children were never observed to use sign language or signs but mainly used nonverbal communication strategies and sometimes spoken language. This observation might be surprising because children at this age are expected to be aware of which language their interaction partners use (Petitto et al., 2001), however, this was observed in children growing up bimodal-bilingually from birth. In contrast, factors like language dominance and sociolinguistic context induce the use of the national language for active communication in bilingual children irrespective of their interlocutors´ language (Paradis and Nicoladis, 2007; see Müller et al., 2011 for an overview). This is reported for children acquiring a second language in a monomodal bilingual kindergarten setting as well (Wode, 2009). Our findings are in line with these observations. Additionally, it might be the case that the hearing children just do not have sufficient sign language skills yet to use signs in interactions.

In peer interactions, signs were barely used by hearing children as well: According to the questionnaire data, only two hearing children used a combination of words and signs, the child with language development delay due to epilepsy and one child without disabilities and growing up monolingually. This reveals that the child with epilepsy could communicate better with signs in some situations and, thus, could participate more easily in interactions. Therefore, this child benefited from the signs introduced in the group as indicated by richer sign than spoken vocabulary and the use of the visual modality for communication with both, educators and children. Using signs may have enabled that child to compensate for spoken language skills that were more challenging to acquire because of her individual background. Thus, a visual language may have been another way to participate in interactions. This assumption is additionally supported by the data from other children with language development delays who sporadically used mixed modalities in communication with hearing educators of our co-enrollment group and is consistent with Goppelt-Kunkel et al. (2021) as well. However, in peer interactions during the analyzed free play, the children undergoing speech therapy did not use signs at all but mainly nonverbal communication strategies and, rarely, spoken language. Perhaps, despite their limited spoken language skills, these children tried to communicate with the other hearing children in the language most used by them, the national language, consistent with observations in bilingual kindergarten settings (Wode, 2009). Additionally, please keep

in mind that the child with epilepsy was present on only one of the two survey days when the deaf child was present, so that only half of the video data did allow for common interactions with the deaf child mainly interacting in sign language. The hearing child who was reported to use signs in peer interactions might use signs depending on its interaction partners. However, this is not observed in the video data. The only child that used sign language in a peer interaction with the deaf child in the video data was a different child receiving ergotherapy, growing up bilingually and showing a language development delay. This rare use of the visual–spatial language modality by hearing children makes almost all peer interactions between hearing children linguistically inaccessible to the deaf child.

The deaf child predominantly interacted with educators, especially with the deaf educator, consistent with the observations in Preisler et al. (2002) reporting this for mainstream settings with sign language competent assistants. For interactions with the deaf educator, the child predominantly used sign language, whereas with hearing educators, she predominantly used nonverbal communication strategies and somewhat less sign language. This suggests that the deaf child shows sensitivity to the educator's language and, therefore, adapts to the educator's language skills as described in Petitto et al. (2001). In peer interactions, according to the video data, the deaf child used mainly nonverbal communication strategies, occasionally sign language, and somewhat less frequently spoken language. Again, the deaf child presumably assesses the hearing peer's language skills and chooses the most successful way to participate in interactions. With predominantly nonverbal communication, the peer communication behavior of the deaf child in the co-enrollment group less resembles bimodal-bilingual settings with DHH peers communicating in sign language but is rather comparable with observations from settings with speech accompanying signs or mainstream settings with hearing sign language assistants (Preisler et al., 2002; Antia et al., 2011; Schulz, 2016). But these settings lack age-appropriate language peers for deaf children to interact with. Thus, in addition to sign language input provided by educators, the presence of other DHH children seems to be crucial for the use of sign language in peer interactions with age-appropriate language (Spencer et al., 1994; Preisler et al., 2002; Ardito et al., 2008). Furthermore, the educators reported in the questionnaire that the deaf child needed assistance of adults to get involved in playing with other children and communicated in indistinct spoken language with them. The

need for adult assistance to participate in peer interactions is consistently reported for deaf children in mainstream settings with sign language competent assistants (Preisler et al., 2002). So, six months after enrollment, the deaf child did not have equal chances to participate in interactions during free play as her hearing peers almost exclusively communicated in the auditory-vocal modality. Therefore, joining ongoing interactions seemed to be particularly challenging for the deaf child, even though it might be the case that some children already had prior knowledge of signing. As an additional factor, we need to consider that the deaf child was one of the youngest children in the group and peer-interaction is known to increase with age (Rubin et al., 1998). It must also be kept in mind that for DHH children in particular, time and familiarity with their peers seem to be important factors that might improve interactions (Lederberg et al., 1986; Kurkjian and Evans, 1988; Rodríguez and Lana, 1996). Nonetheless, more sign language competent peers are needed, as it is known from previous research that this is an important prerequisite for age-appropriate communication between peers (Preisler et al., 2002) also in a bimodal-bilingual setting (Ardito et al., 2008). Furthermore, language planning and modality planning, i.e., designated rooms or times in which communication is required exclusively in the visual modality, could increase the sign use of hearing children. On the one hand, this concept requires focused attention of the hearing children on the visual modality and, on the other hand, might lead to increased sign language skills in these children for peer interactions.

5.3. Limitations

The heterogenous group in our study provided a unique opportunity to examine the sign learning and use of deaf and hearing children with and without disabilities in a bimodal-bilingual kindergarten setting with a deaf educator and hearing educators. But investigating this small co-enrollment sample also led to some limitations: The small sample size limited the statistical power of the comparison of the sign scores of the hearing children of our co-enrollment group with the sign scores of groups with only hearing educators from Schüler et al. (2021) as well as of the reported correlation exploring the relation between sign score and spoken language skills. Future studies should include a more homogenous group and an increased sample size.

Furthermore, the test used to assess the spoken language skills might not reflect individual differences in our data sufficiently. The SBE-3-KT was used to allow for a

direct comparison with the data from Schüler et al. (2021), however, the test is normed for children from 32 to 40 months. Therefore, future studies with more age-appropriate spoken language assessments are needed in order to more accurately capture the relation between sign learning and spoken language abilities in bimodal-bilingual kindergarten settings.

Another restricting factor could be previous sign knowledge of the hearing children. It cannot be ruled out that some children had contact with signs prior to the hiring of the deaf educator since the deaf child attended another group within the same kindergarten before enrollment in the observed group. Moreover, another deaf child attended the kindergarten two years ago, but in a different group. However, data from Schüler and Hänel-Faulhaber (2023) suggest that time of sign exposure might have less impact on sign learning than sign language role modeling. They measured the sign learning of children with and without disabilities 18 months after their hearing educators were exposed to signs and observed a lower sign score than in our co-enrollment group indicating that longer exposure to signs does not lead to such effective sign learning as observed when sign language input is provided by a deaf educator.

Finally, it should be noted that the deaf child is one of the youngest children in the group and peer interaction is known to increase with age as mentioned above. To some extent, the lower number of interactions of the deaf child with other children could also be influenced by this fact. In addition, the deaf child attended the group for a shorter period of time than almost all other children studied. As outlined above, time and familiarity with peers are relevant for interactions of deaf children in particular, therefore, these factors might also have had an influence on the observed peer interactions.

6. Conclusion

Overall, we observed that hearing children learned signs, but they barely used these for interactions, not even with deaf interlocutors. This suggests that more sign language input as well as language planning encouraging these children to use sign language are needed. Improving normally developing children's sign language use in interactions is additionally important to increase opportunities for children who use sign language or signs for communication to participate in interactions: In our study,

hearing children with language development delays used signs in restricted contexts. In particular for the deaf child, the fact that six months after co-enrollment hardly any signs were used in interactions during free play, especially between peers, limited the possibilities to participate in interactions. In addition to targeted approaches that strengthen the use of the visual modality, the presence of more deaf peers (Spencer et al., 1994; Ardito et al., 2008), and more deaf educators is required. Other factors should be kept in mind such as time to increase both familiarity between children and children's sign language skills.

Data availability statement

The original contributions presented in the study are included in the article/Supplementary material, further inquiries can be directed to the corresponding author.

Ethics statement

Ethical review and approval was not required for the study on human participants in accordance with the local legislation and institutional requirements. Written informed consent to participate in this study was provided by the participants' legal guardian/next of kin.

Author contributions

MG-K and BH-F contributed to the conceptualization and design of the study. MG-K conducted the investigation and wrote the original draft. MG-K and AW performed the formal analysis. MG-K, AW, and BH-F were involved in writing, reviewing, and editing of the manuscript. BH-F supervised and provided funding for the investigation. All authors contributed to the article and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Supplementary material

The Supplementary material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpsyg.2022.920497/full#supplementary-material

Kapitel III

Interpretation, Bewertung und Diskussion der Einzelarbeiten

1. Zusammenführung und weiteres Vorgehen

In dieser Arbeit wurde untersucht, ob, wie und unter welchen Bedingungen die Partizipation von Kindern mit SEND an Peer-Interaktionen in inklusiven Kitas durch das Angebot Spielaktivitäten und/oder Gebärden(sprache) verbessert werden kann. Dabei lag ein besonderer Schwerpunkt auf Kindern mit sprachlichem Förderbedarf und insbesondere Kindern mit Hörbehinderungen. Zunächst wurde in Studie 1 untersucht, inwieweit sich das Interaktionsverhalten von Kindern mit SEND vom Interaktionsverhalten von Kindern ohne SEND unterscheidet. Kinder mit SEND waren tendenziell weniger in Peer-Interaktionen involviert und signifikant häufiger in Interaktionen mit Fachkräften, was den aktuellen Forschungsstand bestätigt. Deshalb wurde zum einen analysiert, inwieweit Spielaktivitäten in Zusammenhang mit dem Interaktionsverhalten von Kindern mit und ohne SEND stehen (Studie 1). Im folgenden Kapitel 2 wird weitergehend interpretiert, bewertet und diskutiert, ob, warum und wie welche Spielaktivitäten Förderfaktoren für Peer-Interaktionen von Kindern mit und ohne SEND darstellen können.

Zum anderen wurde in den weiteren Studien der Fokus auf Gebärden(sprachen) als mögliche Förderfaktoren gelegt. Inwieweit Ikonizität beim Erlernen von Gebärden in inklusiven Kitasettings eine Rolle spielt (Studie 2) wurde ebenso untersucht wie das Gebärdenlern- und nutzungsverhalten in inklusiven Kitagruppen, in denen die Fachkräfte Gebärden in einer Weiterbildung gelernt hatten (zusammenfassend im Poster dargestellt). Vergleichend dazu wurde analysiert, inwieweit sich das Gebärdenlern- und -nutzungsverhalten hörender Kinder im Co-Enrollment-Setting mit einer tauben Fachkraft und einem tauben Kind vom Gebärdenlern- und -nutzungsverhalten in inklusiven Gruppen mit hörenden Fachkräften und einer Weiterbildung mit Gebärden unterscheidet und wie es sich hier bei den Kindern mit und ohne SEND gestaltet (Studie 3). Diese Daten werden jeweils genutzt, um in Kapitel 3 zusammenfassend zu interpretieren, zu bewerten und zu diskutieren, inwieweit und unter welchen Bedingungen lautsprachunterstützende Gebärden und Gebärdensprachen Förderfaktoren für die Peer-Interaktionen von Kindern mit und ohne SEND darstellen können. Dabei wird neben Einflussfaktoren auf das Gebärdenlern- und Nutzungsverhalten (3.1. bis 3.3.) der Kinder die Optimierung der Gebärdenlern- und Nutzungsbedingungen durch weitere Maßnahmen (3.4.) diskutiert.

2. Spielaktivitäten als Förderfaktoren?

Obwohl ökologische Einflussfaktoren und insbesondere Aktivitätssettings und ihr Einfluss auf Peer-Interaktionen von Kitakindern mit und ohne SEND bislang wenig untersucht wurden (Heimlich, 2017; Kluczniok & Schmidt, 2021), deuten die vorhandenen Studien darauf hin, dass bestimmte Spielaktivitäten Förderfaktoren hierfür darstellen können (Ivory & McCollum, 1999; Kim et al., 2003; Martin et al., 1991; Rubin & Howe, 1985; Trawick-Smith et al., 2011). Die meisten Studien an Kitakindern mit und ohne SEND kategorisierten Spielzeuge wie Bälle, Bausteine, Verkleidungssachen, Haushaltsspielzeug, Puppen oder Spielzeugfahrzeuge als „soziale" Spielzeuge, bei denen Kinder eher miteinander spielen (Kallam & Rettig, 1991; Kim et al., 2003; Ivory & McCollum, 1999; Rubin, 1977a, 1977b; Trawick-Smith et al., 2011). Spielzeuge wie Puzzles, Knete oder Kunstmaterialien hingegen wurden eher als „isolierte" Spielzeuge kategorisiert (Kallam & Rettig, 1991; Kim et al., 2003; Rubin, 1977a, 1977b; Trawick-Smith et al., 2011).

Diese Beobachtungen wurden jedoch bei Kindern mit SEND vor allem in experimentellen Studien gemacht (Beckman & Kohl, 1984; Kallam & Rettig, 1991; Martin et al., 1991; Kim et al., 2003). In den wenigen kleinen Studien in der natürlichen Umgebung integrativer bzw. inklusiver Kitagruppen konnten diese Ergebnisse nicht oder nur für einzelne Kinder bestätigt werden (Driscoll & Carter, 2009; O'Gorman Hughes & Carter, 2002). Für Kinder ohne SEND hingegen wurden in nicht-experimentellen Studien in Regelsettings die positiven Effekte der als „sozial" kategorisierten Spielzeuge auf Peer-Interaktionen ebenfalls gefunden (Rubin, 1977a, 1977b; Trawick-Smith et al., 2011). Aber experimentelle Studien in integrativen bzw. inklusiven Settings erbrachten für Kinder ohne SEND unterschiedliche Ergebnisse, ob soziale Spielzeuge auch hier für sie soziale Interaktionen wahrscheinlicher machen (Beckman & Kohl, 1984) oder nicht (Kallam & Rettig, 1991; Martin et al., 1991).

Aufgrund der dünnen Datenlage und der abweichenden Ergebnisse wurde im Rahmen der ersten Studie im natürlichen Setting inklusiver Kitagruppen untersucht, ob und inwieweit sich Kinder mit und ohne SEND darin unterscheiden, bei welchen Spielaktivitäten ihre Peer-Interaktionen vor allem stattfanden. Dabei zeigte sich, dass die Interaktionen von Kindern mit SEND entgegen den Kategorisierungen auf Basis

experimenteller Studien am häufigsten und signifikant häufiger als von Kindern ohne SEND bei „isolierten“ Spielaktivitäten wie Malen, Basteln oder Puzzeln stattfanden.

Zudem wurde untersucht, ob sich in einer größeren Studie die Beobachtung aus einer Studie an zwei Kindern mit Förderbedarf von O’Gorman Hughes und Carter (2002) bestätigt, dass Kinder mit Förderbedarf in inklusiven Settings mit „isolierten“ Spielzeugen eher mit anderen Kindern mit Förderbedarf spielen als beim Spielen mit „sozialen“ Spielzeugen. Dies war in unserer Stichprobe tatsächlich der Fall, während für Kinder ohne Förderbedarf kein Zusammenhang zwischen Spielaktivitäten und Interaktionspartner:innen gefunden wurde.

Eine Analyse des Interaktionsverhaltens der Fachkräfte in Bezug auf die Spielaktivitäten legte nahe, dass sie zwar bei „isolierten“ Spielaktivitäten häufiger in Interaktionen mit Kindern involviert waren, sie diese jedoch nicht häufiger initiierten als bei „sozialen“ Aktivitäten. Die gemessenen Unterschiede waren also vermutlich nicht oder nur in einem geringen Maß auf das Verhalten der Fachkräfte zurückzuführen, die angewiesen worden waren, sich bei allen Spielaktivitäten gleichermaßen passiv zu verhalten.

Im Folgenden soll vor dem Hintergrund des aktuellen Forschungsstandes weitergehend interpretiert, bewertet und diskutiert werden, aus welchen Gründen diese teilweise konträren, teilweise übereinstimmenden Ergebnisse gefunden worden sein könnten und ob, aus welchen Gründen und unter welchen Bedingungen Spielaktivitäten Förderfaktoren für Kinder mit und ohne SEND in inklusiven Gruppen darstellen könnten.

Warum die wenigen Untersuchungen im natürlichen Setting einer inklusiven Gruppe nicht die in experimentellen Studien gefundenen Unterschiede zugunsten „sozialer“ Spielzeuge für Peer-Interaktionen von Kindern mit SEND fanden, könnte auf die vielen Unterschiede im Untersuchungsdesign zurückzuführen sein (vgl. Driscoll und Carter, 2009): Zum ersten wurden viele der beschriebenen experimentellen Studien in kleineren Räumlichkeiten durchgeführt, die entweder innerhalb der regulären Gruppenräume abgegrenzt wurden oder außerhalb davon mit Spielzeugen präpariert wurden. Zum zweiten wurden in experimentellen Studien die Gruppen gezielt zusammengestellt, sodass die Gruppengröße und ihre Zusammensetzung sich von derjenigen im regulären Kitaalltag unterschied. Drittens könnten verschiedene Typen

und Grade von Förderbedarf zu unterschiedlichen Ergebnissen geführt haben. Daneben stellten Driscoll und Carter (2009) die Vermutung an, dass Verzerrungen bei der Veröffentlichung (*publication bias*) dazu geführt haben könnten, dass vor allem Studien veröffentlicht wurden, die signifikante Effekte „sozialer“ Spielzeuge für Peer-Interaktionen gefunden hatten, während sie diese Effekte in ihren Studien nicht (O’Gorman Hughes & Carter, 2002) oder nur für zwei von sechs Kindern (Driscoll & Carter, 2009) gefunden hatten. Aufgrund ihrer kleinen Stichprobengrößen vermuteten Driscoll & Carter (2009), dass ihre Befunde vielleicht nicht allgemein auf Kinder mit Förderbedarf übertragbar sein könnten. Aber in unserer Studie fanden wir sogar das Gegenteil: Die Interaktionen von Kindern mit SEND fanden vor allem bei „isolierten“ Spielaktivitäten wie Malen, Basteln und Puzzeln statt und das signifikant häufiger als bei Kindern ohne SEND. Zwar müsste überprüft werden, ob dieser Befund auch damit zusammenhängen könnte, dass Kinder mit SEND insgesamt mehr innerhalb dieser Tätigkeiten interagieren. Aber selbst wenn dies der Fall wäre, wären diese „isolierten“ Spielaktivitäten ein förderlicher Nährboden für Peer-Interaktionen von Kindern mit SEND. Möglicherweise bieten sie Kindern mit SEND Chancen, bei Spielaktivitäten zu interagieren, die weniger komplexe Anforderungen stellen: Bei den eingangs erwähnten kognitiven Levels von Smilansky (1968) erfordern „soziale“ Spielaktivitäten wie Rollenspiel mit Puppen, Fahrzeugen, Verkleidungs- oder Haushaltsspielzeug Kompetenzen auf dem höchsten kognitiven Level „dramatic play“. Die Kinder müssen in der Lage sein, imaginäre Spielmotive zu verfolgen und damit Zusammenhängendes auszuhandeln, wofür sie in ihrer kognitiven und auch sprachlichen Entwicklung weit genug fortgeschritten sein müssen. Auch bei anderen „sozialen“ Spielaktivitäten wie dem Bauen mit verschiedenen Spielzeugen dürfte dies eine wichtige Rolle spielen, während beim Toben, Tanzen und Turnen daneben die motorische Entwicklung relevanter ist.

Auch das Ergebnis, dass Kinder mit SEND bei “isolierten” Aktivitäten wie Malen, Basteln oder Puzzeln wahrscheinlicher mit anderen Kindern mit SEND interagieren als mit Kindern ohne SEND, stützt diese These. Dies dürfte, wie auch in Paper 1 geschrieben, nicht nur daran liegen, dass Kinder mit SEND möglicherweise insgesamt häufiger in diesen „isolierten“ Spielkontexten spielen, da für Kinder ohne SEND keine Zusammenhänge zwischen Spielaktivitäten und SEND der Interaktionspartner:innen gefunden wurden. Vielmehr dürfte es für Kinder mit SEND wie eben geschrieben

leichter sein, bei „isolierten“ Spielaktivitäten wie Malen oder Basteln Interaktionen zu initiieren und aufrechtzuerhalten, die weniger komplexe Kompetenzen erfordern als „soziale“ Spielaktivitäten wie beispielsweise Rollenspiel mit Verkleidungs- oder Haushaltsspielzeug (O’Gorman Hughes & Carter, 2002). Studien zeigen auch, dass Kinder mit Förderbedarf insgesamt eher auf niedrigeren kognitiven Spiellevels und eher mit anderen Kindern mit Förderbedarf interagieren (Kim et al., 2003). Es scheint unseren Studienergebnissen nach also wichtig zu sein, in inklusiven Settings gerade auch „isolierte“ Spielaktivitäten wie Malen, Basteln oder Puzzeln im Freispiel zu ermöglichen beziehungsweise die dafür nötigen Materialien bereitzustellen. Dadurch werden Kindern mit SEND gute Chancen geboten, auch bei weniger weit fortgeschrittener kognitiver und möglicherweise auch sprachlicher oder motorischer Entwicklung Peer-Interaktionen zu initiieren und aufrechterhalten zu können.

Allerdings darf dabei nicht außer Acht gelassen werden, dass auch das Erreichen des komplexesten kognitiven Levels des Spiels, des *dramatic play* nach Smilansky (1986) ermöglicht und anvisiert werden sollte, da durch die Übernahme von Rollen soziale und kooperative Kompetenzen weitergehend gefördert werden (Kim et al., 2003). Hierfür benötigen Kinder mit SEND möglicherweise nicht nur bereitgestellte Spielmaterialien, sondern gegebenenfalls auch gezielte Unterstützung, um an Interaktionen beim Rollenspiel teilhaben zu können (Strain & Odom, 1986). Dabei sollte der Fokus selbstverständlich nicht nur auf der Quantität der Interaktionen bei den jeweiligen Spielaktivitäten liegen, wie es in dieser Studie der Fall war, sondern insbesondere auch auf ihrer Qualität und deren bedarfsorientierter Verbesserung.

Daher scheint es unseren Ergebnissen nach wichtig zu sein, Spielzeuge beziehungsweise Spielaktivitäten eher nicht einfach als „isoliert“ oder „sozial“ einzugruppieren. Dies hatten auch O’Gorman Hughes und Carter (2002) vorgeschlagen mit dem Hinweis, dass sie vielmehr im Zusammenhang mit weiteren Faktoren wie der Spielzeugpräferenz, dem Alter der Kinder, ihrem Entwicklungsstand, ihren sozialen Fähigkeiten, der Art ihres Förderbedarfs und den Merkmalen des/der Interaktionspartner:in betrachtet werden sollten. Dem würde ich mich gerne anschließen mit dem Vorschlag, sie angesichts der Relevanz von Peer-Interaktionen für die kindliche Entwicklung vorwiegend in Verbindung mit den Anforderungen an die Interaktionskompetenzen der Kinder bzw. ihre kognitiven Spiellevels nach Smilansky (1968) zu sehen und daran orientiert bereitzustellen. Kinder mit und ohne

SEND entwickeln ihre Interaktionskompetenzen im Kindergartenalter jedoch schrittweise weiter (Corsaro, 2013). Deshalb sollte für eine effektive Förderung immer der nächste Schritt für die Kinder präsent sein (vgl. Pauen & Ganser, 2014) und insbesondere Kinder mit SEND bedarfsorientiert beim Erreichen des nächsten Levels unterstützt werden. An dieser Stelle erscheint es also bei Bedarf sinnvoll, Maßnahmen wie das Bereitstellen von Spielzeugen, die Umweltfaktoren manipulieren, um Peer-Interaktionen zu fördern, um Maßnahmen zu ergänzen, die Kindern mit SEND erforderliche Kompetenzen näherbringen (*child specific*). Daneben dürfte es hilfreich sein, Maßnahmen zu implementieren, bei denen – dem inklusiven Gedanken folgend – andere Kinder dazu befähigt und motiviert werden, Kinder mit SEND bedarfsangepasst beim Eintreten in und beim Aufrechterhalten von Interaktionen bei der jeweiligen Spielaktivität zu unterstützen (*peer-mediated*).

Spielaktivitäten stellen also unseren Ergebnissen nach mögliche Förderfaktoren für Peer-Interaktionen von Kindern mit und ohne SEND dar, die zudem, wie auch andere Maßnahmen, die Umweltfaktoren manipulieren, um Peer-Interaktionen zu fördern, einfach zu implementieren sind, wenig fachliche Weiterbildung und Zeit erfordern sowie ressourceneffizient sind (Driscoll & Carter, 2004; Odom et al., 1993). Gerade Spielaktivitäten wie Malen, Basteln und Puzzeln scheinen aufgrund geringerer Anforderungen an Interaktionskompetenzen ein geeigneter Ausgangspunkt für Kinder mit SEND für Peer-Interaktionen zu sein. Dabei sollten Spielaktivitäten jedoch nicht nur pauschal kategorisiert werden, sondern möglichst in Zusammenhang mit den individuellen Voraussetzungen und Vorlieben der Kinder betrachtet und variiert werden. Insgesamt sollte darauf geachtet werden, dass stets Spielaktivitäten bereitstehen, die dem Entwicklungsstand der Kinder gerade auch in Bezug auf ihre Interaktionskompetenzen entsprechen und dass gegebenenfalls insbesondere Kinder mit SEND Hilfestellung von Seiten der Fachkräfte oder auch – vermittelt durch die Fachkräfte – von Seiten anderer Kinder erhalten, um nach und nach auch bei komplexeren Spielaktivitäten besser interagieren zu können. Hierbei sollte auch die Qualität der Peer-Interaktionen im Blick behalten und gegebenenfalls bedarfsangepasst gefördert werden. So kann durch die Kombination verschiedener Maßnahmen ein möglichst inklusives Umfeld für Kinder mit SEND bereitgestellt werden, in dem ihre Chancen zur Partizipation an Peer-Interaktionen optimiert werden.

3. Gebärden(sprachen) als Förderfaktoren?

Da insbesondere fehlende Sprachkompetenzen einen Risikofaktor dafür darstellen, nicht oder weniger an Peer-Interaktionen in Kitas teilhaben zu können (Odom et al., 2002), ist es naheliegend, Maßnahmen, die sprachliche und kommunikative Kompetenzen fördern, zu konzipieren, zu implementieren und zu evaluieren. Dabei ist es wichtig, neben der auditiv-verbalen auch die visuell-gestische Modalität zu berücksichtigen, da nicht alle Kinder gleichermaßen Zugang zur Lautsprache haben. Eine Reihe an Studien hatte bereits nahegelegt, dass neben Kindern mit Hörbehinderung auch Kinder mit anderen Behinderungen und/oder Förderbedarfen von Gebärden und Gebärdensprache für Kommunikation und Interaktionen profitieren können (Bonvillian et al., 1981; Ellis Weismer & Hesketh, 1993; Goldstein, 2002; Kay-Raining Bird et al., 2000; Kiesel et al., 2009; Lüke & Ritterfeld, 2014; Nunes 2008; Vogt & Kauschke, 2017; Wagner & Sarimski, 2012). Dies könnte darin begründet liegen, dass Kinder abhängig von ihren körperlichen oder kognitiven Voraussetzungen möglicherweise bestimmte Fähigkeiten, die nur oder besonders für die Produktion und Rezeption von Lautsprache relevant sind, in der visuell-gestischen Modalität nicht oder weniger benötigen, sodass eine Kompensation möglich ist (siehe Paper 2). Aber selbst Kinder ohne SEND scheinen von Gebärden(sprachen) zu profitieren (Capone Singleton, 2012; Ellis Weismer & Hesketh, 1993; Goodwyn et al., 2000; Mumford & Kita, 2014; Vogt & Kauschke, 2017). Allerdings bestand bislang ein Mangel an größeren, förderschwerpunktübergreifenden Studien, in denen untersucht wird, inwieweit und unter welchen Bedingungen Kinder mit SEND in inklusiven Kitasettings Gebärden und ggf. auch Gebärdensprache lernen und für Peer-Interaktionen nutzen. Daher wurde dies im Rahmen des Projektes „UKfa“ untersucht. Im Rahmen dieser Arbeit wurde ein Schwerpunkt darauf gelegt, inwieweit Ikonizität beim Erlernen von Gebärden durch Kitakinder mit und ohne SEND eine Rolle spielt, aber auch untersucht und zusammengeführt, welche weiteren Faktoren Einfluss auf das Gebärdenlern- und Nutzungsverhalten im beforschten inklusiven Setting haben. Zudem wurde analysiert, wie sich das Gebärdenlern- und Nutzungsverhalten im Vergleich dazu unter veränderten Inputbedingungen durch mehr Gebärdensprache mit einer tauben Fachkraft sowie bei einer veränderten Gruppenzusammensetzung mit einem tauben, gebärdensprachnutzenden Kind gestaltet und welche

Partizipationsmöglichkeiten an Peer-Interaktionen ein solches Setting für das taube Kind und die anderen Kinder mit und ohne SEND bietet.

3.1. Welche Rolle spielt Ikonizität?

Darauf, dass Ikonizität beim Erlernen von Wörtern hilfreich ist, deutet die Studienlage sowohl beim lautsprachlichen Wortschatz hörender Kinder (Imai et al., 2008; Laing, 2019; Maurer et al., 2006; Massaro & Perlman, 2017; Motamedi et al., 2021; Ozturk et al., 2013; Peña et al., 2011; Perlman et al., 2017; Perry et al., 2015, 2017; Sidhu et al., 2021; Tzeng et al., 2017; für einen Überblick siehe Nielsen & Dingemanse, 2021) als auch beim gebärdensprachlichen Wortschatz tauber Kinder (Thompson et al., 2012; Caselli & Pyers, 2017; 2020) recht einstimmig hin. Selbst in einer Zweitsprache in einer anderen Modalität, also beim Erlernen von Gebärden oder Gesten oder dem Erkennen von Gebärden, scheinen nicht-gebärdende Kinder sensibel für Ikonizität zu sein (Brown, 1977 in Luftig, 1982; Marentette & Nicoladis, 2011; Magid & Pyers, 2017; Page, 1982 in Luftig, 1982; Tolar et al., 2008). Unsere Ergebnisse deuten damit konsistent ebenfalls darauf hin, dass auch Kinder ohne Gebärdensprachkenntnisse Ikonizität beim Erlernen von Gebärden tendenziell zu nutzen scheinen. Die Kitakinder mit und ohne SEND lernten tatsächlich Gebärden mit einem höheren Ikonizitätsgrad etwas wahrscheinlicher. Dies war jedoch insgesamt nur ein Trend und traf signifikant häufiger für ältere Kinder im Vergleich zu jüngeren Kindern zu. Kinder ohne SEND profitierten wider Erwarten nicht mehr von Ikonizität als Kinder ohne SEND, tendenziell sogar etwas weniger.

Ebenfalls konsistent mit der bisherigen Studienlage sind unsere Ergebnisse, dass Ikonizität mit steigendem Alter stärker genutzt wird (gefunden für den Gebärdenspracherwerb tauber Kinder von Thompson et al., 2012, für das Erlernen ikonischer und arbiträrer Gesten durch nicht-gebärdende Kinder von Magid & Pyers, 2017 sowie Marentette & Nicoladis, 2011, für das Erkennen ikonischer Gebärden durch nicht-gebärdende Kinder von Tolar et al., 2008 und für das Erkennen ikonischer Gesten von Magid & Pyers, 2017). Begründet wird dies damit, dass die Sensibilität für Ikonizität sich mit zunehmendem Alter weiterentwickelt (z.B. Tolar et al., 2008; Marentette & Nicoladis, 2011; Thompson et al., 2012), wobei sie ab dem Alter von drei Jahren stabiler wird und dann noch weiter steigt (z.B. Tolar et al., 2008; Thompson et al., 2012; Caselli & Pyers, 2017). Besonders Erfahrungen scheinen eine wichtige

Rolle zu spielen, aber auch räumliche Kognition, Fähigkeiten des analogen Denkens und metalinguistische Abstraktionsfähigkeiten scheinen relevant zu sein (Tolar et al., 2008; Perniss & Vigliocco, 2014; Magid & Pyers, 2017; Karadöller et al., 2022). So dürften neben angeborenen Mechanismen auch erlernte Mechanismen eine Rolle spielen (Fort et al., 2018), worauf auch die Tatsache hindeutet, dass taube Kinder mit Gebärdensprache als Muttersprache Ikonizität früher nutzen als Kinder ohne Erfahrungen mit einer ikonizitätsreichen Sprache (Magid & Pyers, 2017).

Da einige Studien darauf hindeuteten, dass insbesondere Kinder mit bestimmten Diagnosen oder Förderbedarfen beim Erlernen von Gebärden von Ikonizität profitieren (Bonvillian et al., 1981; Konstantareas et al., 1978; Lloyd et al., 1985), mag das Ergebnis unserer Studie, dass die Kinder mit SEND unserer Stichprobe Ikonizität tendenziell sogar weniger nutzten als die Kinder ohne SEND, zunächst überraschend sein. Allerdings ist es vor dem Hintergrund des vorherigen Absatzes logisch nachvollziehbar, da bestimmte kognitive Fähigkeiten und erlernte Mechanismen weit genug entwickelt sein müssen, um Ikonizität zu nutzen. Dies könnte für die Gruppe der Kinder mit SEND in unserer Stichprobe im Durchschnitt weniger der Fall gewesen sein als für die Kinder ohne SEND. Allerdings ist es durchaus möglich, dass einzelne Kinder mit SEND ein abweichendes Muster zeigen, was differenzierter unter Berücksichtigung der jeweiligen Diagnosen und Förderbedarfe analysiert werden müsste. Bisherige Studien hatten zwar teilweise Kinder mit ähnlichen Diagnosen zusammenfassend untersucht, jedoch mit etwas älteren Kindern mit SEND – mit dadurch möglicherweise schon weiter entwickelten Fähigkeiten als Kinder im Kitaalter und ohne eine Vergleichsgruppe hörender Kinder.

Ikonizität scheint also tendenziell durchaus von Kitakindern beim Erlernen von Gebärden, die aus einer anderen Sprache und einer anderen Modalität entnommen wurden, genutzt zu werden. Jedoch dürften vor allem in ihrer Entwicklung weiter fortgeschrittene Kinder davon beim Lernprozess profitieren, weil sie die nötigen Voraussetzungen für ihre Nutzung eher mitbringen als jüngere Kinder oder Kinder mit bestimmten Diagnosen oder Förderbedarfen. Deshalb sollten Gebärden Kindern unabhängig von ihrem Ikonizitätsgrad angeboten werden – gerade auch Kindern mit SEND. Es besteht jedoch weiterer Forschungsbedarf, um besser einschätzen zu können, ob möglicherweise vereinzelt für Kinder mit bestimmten Diagnosen andere Lernmuster vorliegen.

3.2. Welche Rolle spielen weitere Faktoren auf Seiten der Kinder?

Sowohl in den inklusiven Kitagruppen aus dem UKfa-Projekt, in denen die hörenden Fachkräfte Gebärden gelernt hatten (Poster) als auch in der Co-Enrollment-Gruppe mit tauber Erzieherin (Paper 3) zeigte sich, dass vor allem Kinder, die in ihrer Lautsprachentwicklung weiter fortgeschritten waren, durchschnittlich mehr Gebärden gelernt hatten als Kinder mit weniger weit entwickelter Lautsprachentwicklung. Dies ist nicht verwunderlich, da auch aus der Mehrsprachigkeitsforschung bekannt ist, dass Kinder Kompetenzen aus einer Sprache für den Erwerb bzw. das Erlernen weiterer Sprachen nutzen (Chilla et al., 2013). Allerdings waren in unserer Stichprobe daneben auch Kinder, die entgegengesetzte Lernprofile zeigten: Beispielsweise gab es im UKfa-Projekt zwei Kinder mit Trisomie 21, die einen größeren Gebärden- als Lautsprachwortschatz hatten (Hänel-Faulhaber et al., 2022) und in der Co-Enrollment-Gruppe ein Kind mit das Sprachzentrum betreffender Epilepsie, bei dem dies ebenfalls der Fall war und dessen Gebärdenwortschatz größer als der durchschnittliche Gebärdenwortschatz der anderen hörenden Kinder der Gruppe war. Diese Kinder schienen – ebenso wie das taube Kind – Gebärden(sprache) aufgrund der visuell-gestischen Modalität kompensierend einsetzen zu können.

Gerade von und mit diesen Kindern wurden Gebärden daher auch am ehesten bei Peer-Interaktionen genutzt: So wurden in der inklusiven Kitagruppe, in der das Kind mit Trisomie 21 war, von dem Videodaten vorliegen, deutlich mehr Gebärden bei Peer-Interaktionen genutzt als in allen anderen inklusiven Kitagruppen mit ebenfalls hörenden Fachkräften, bei denen dies kaum der Fall war. Auch nutzte das Kind mit Epilepsie aus der Co-Enrollment-Gruppe den Fragebogendaten aus dem pragmatischen Profil zufolge neben Lautsprache Gebärden(sprache) bei Peer-Interaktionen, was dort nur bei einem weiteren hörenden Kind angegeben wurde. Dieses weitere hörende Kind war das älteste Kind der Gruppe unter den Kindern ohne SEND, was darauf hindeutet, dass weiter in ihrer Sprachentwicklung fortgeschrittene Kinder Gebärden nicht nur überdurchschnittlich schnell lernen, sondern sie auch eher bei Peer-Interaktionen einsetzen (können). Auch die UKfa-Videodaten stützen diese Annahme: Die Kinder, die beispielsweise dem Kind mit Trisomie 21 gegenüber Gebärden einsetzten, waren zum zweiten und dritten Erhebungszeitpunkt sogar noch deutlich älter als das hörende Kind aus der Co-Enrollment-Gruppe und hatten ebenfalls einen überdurchschnittlich großen Gebärdenwortschatz im Vergleich zu den anderen

hörenden Kindern aus den UKfa-Daten. Auch wenn anhand größerer Datensätze geprüft werden müsste, inwieweit diese Ergebnisse allgemein übertragbar sind, deutet alles in unseren Daten darauf hin, dass gerade ältere Kitakinder eine wichtige Ressource für gebärden(sprach)orientierte Kinder bei Peer-Interaktionen darstellen können. Den Videodaten zufolge nutzte auch das taube Kind Gebärden(sprache) bei Peer-Interaktionen mit den hörenden Kindern – wenn auch deutlich weniger als non-verbale Kommunikation. Dies deutet darauf hin, dass es sich vermutlich aufgrund der bislang zu geringen Gebärdensprachkompetenzen seiner hörenden Peers bei Interaktionen kommunikativ an sie anzupassen versuchte (vgl. Pettito et al., 2001) – anstatt dem inklusiven Gedanken folgend andersherum. Dies dürfte unter anderem mit der „Dominanz" der Landessprache zusammenhängen, die sich auch auf die Erwerbsverläufe monomodal-bilingual aufwachsender Kinder auswirkt, was schon früh in Tagebuchstudien von Eltern dokumentiert wurde, die mit ihren Kindern für bestimmte Zeiträume in Ländern mit verschiedenen Sprachen lebten (vgl. Leopold 1970, Berman, 1979 und Burling, 1959 in Müller et al., 2011). Möglicherweise spielt zusammenhängend damit auch der Status bzw. das Prestige der lautsprachlichen Landessprache eine Rolle, wofür den Beobachtungen in monomodal-bilingualen Kitas zufolge bereits Kindergartenkinder sensibel zu sein scheinen, sodass sie diese präferieren – selbst dann, wenn sie, anders als in der Co-Enrollment-Gruppe, nicht Mehrheitssprache in der Kita-Gruppe ist (vgl. Wode, 2009). Auch wurde beim Erwerb von Weltsprachen als Zweitsprache in Kitas anhand der kindlichen Spracherwerbs- und -nutzungsverläufe festgestellt, dass Immersion, also die Sprache als eine Art „Sprachbad" durch die Sprache anzuwendende Fachkräfte bereitzustellen, möglicherweise nicht für ihren erfolgreichen Erwerb ausreichen dürfte, sondern daneben angepasste Didaktik erforderlich ist (Doyé 2009). Dies alles legt einen hohen Bedarf an didaktischen Maßnahmen nahe, die die Stellung und Präsenz von Gebärdensprache stärken, um Peer-Interaktionen für gebärden(sprach)nutzende Kinder gleichberechtigter zugänglich zu machen (konkretisiert in Kapitel 3.4.).

Daneben scheint Mehrsprachigkeit ein Faktor zu sein, der das Erlernen und Nutzen von Gebärden möglicherweise fördert bzw. bei dem Gebärden unter Umständen besonders effektiv erlernt und eher genutzt werden. So zeigte sich in den Daten, bei denen die hörenden Fachkräfte Gebärden gelernt hatten, dass insbesondere mehrsprachig aufwachsende Kinder vereinzelt Gebärden in Fachkraft-Kind-

Interaktionen nutzten (Hänel-Faulhaber et al., 2022). Auch in der Co-Enrollment-Gruppe mit tauber Fachkraft hatte ein dreisprachig aufwachsendes Kind den größten Gebärdenwortschatz der Gruppe, obwohl es in der deutschen Lautsprache deutlich hinter den altersentsprechenden Normen für monolingual aufwachsende Kinder lag (Paper 3). Die anderen mehrsprachig aufwachsenden Kinder der Co-Enrollment-Gruppe hatten jedoch kaum Gebärden gelernt, was auch hier auf individuelle Lernprofile hindeutet.

3.3. Welche Rolle spielen Faktoren auf Seiten der Fachkräfte?

Wie von Schüler et al. (2021) berichtet, wurde das Gebärdenlernverhalten der Kinder im UKfa-Projekt signifikant vom Grad der Implementierung durch die jeweils hörenden Fachkräfte beeinflusst: In Gruppen mit hoher Implementierungsstärke hatten die Kinder sechs Monate nach Interventionsbeginn einen etwa zehnmal so großen Gebärdenwortschatz wie in Gruppen, in denen die Fachkräfte angegeben hatten, dass sie Gebärden kaum im Alltag nutzen (diess., 2021). Die Implementierungsstärke wiederum hing einer Befragung von zwölf Fachkräften 18 Monate nach Interventionsbeginn zufolge vor allem von einer engen Verschränkung von Input-, Erprobungs- und Reflexionsphasen, wahrgenommener Wertschätzung sowie einem guten Teamklima ab (Schüler & Hänel-Faulhaber, 2022).

In der Co-Enrollment-Gruppe hingegen wurde zu Interventionsbeginn eine taube, gebärdensprachkompetente Fachkraft in der Gruppe eingesetzt, sodass für diese keine Weiterbildung nötig war und gebärdensprachlich bereits optimaler Input durch sie bereitgestellt wurde. Daneben und dadurch hatten die hörenden Fachkräfte die Möglichkeit, ihre Gebärdensprachkompetenz nicht nur berufsbegleitend, sondern auch in den Berufsalltag integriert in Interaktionen mit dieser Fachkraft weiter auf- und auszubauen. Es liegt nahe, dass vor allem durch diesen höheren Gebärden(sprach)input der Gebärdenwortschatz der Kinder der Co-Enrollment-Gruppe signifikant höher war als in den UKfa-Gruppen nach dem gleichen Zeitraum von einem halben Jahr. Daneben aber muss der Faktor einbezogen werden, dass ab Interventionsbeginn zudem ein taubes Kind in der Co-Enrollment-Gruppe war. So dürften auch aus diesem Grund Gebärden als nützlicher für Peer-Interaktionen wahrgenommen worden sein als in den meisten UKfa-Gruppen und könnten möglicherweise auch deshalb etwas schneller gelernt worden sein. Allerdings wurden

sie zum Erhebungszeitpunkt nach einem halben Jahr den Videodaten zufolge (noch) kaum bei Peer-Interaktionen genutzt. Da also im Vergleich zu den UKfa-Daten zwei Faktoren, die taube Fachkraft und das taube Kind, gleichzeitig variiert wurden, kann nicht klar getrennt werden, welcher Faktor welchen Anteil am größeren Gebärdenwortschatz der hörenden Kinder der Co-Enrollment-Gruppe hatte. Dies müsste durch Studien in Settings, zwischen denen jeweils nur einer dieser Faktoren variiert, weiter beforscht werden. Dennoch kann angenommen werden, dass, ähnlich wie bei den UKfa-Daten, auch bei der Co-Enrollment-Gruppe den Input-Bedingungen eine wichtige Rolle zukam.

Trotzdem reicht auch der höhere Input durch eine taube Fachkraft und die dadurch vermutlich höhere Gebärden(sprach)kompetenz der hörenden Fachkräfte selbst mit mindestens einem Kind in der Gruppe, das Gebärdensprache „braucht“, nicht aus, um nach einem halben Jahr Peer-Interaktionen für gebärden(sprach)orientierte Kinder gleichberechtigt zugänglich zu machen (siehe Kap. 3.2.). Wie dies verbessert werden kann, soll deshalb im folgenden Absatz diskutiert werden.

3.4. Wie können Gebärdenlern- und -nutzungsbedingungen optimiert werden?

Um die Partizipation an Peer-Interaktionen auch für Kinder zu verbessern, die in der visuell-gestischen Modalität (zeitweise oder dauerhaft) besser kommunizieren können als in der auditiv-oralen Modalität, müssen die Gebärdenlern- und -nutzungsbedingungen für alle Kinder der jeweiligen Gruppen möglichst optimal gestaltet werden. Denn nur, wenn alle Kinder einer inklusiven Kitagruppe sowohl über eine ausreichende Gebärden(sprach)kompetenz verfügen, um überhaupt in der visuell-gestischen Modalität kommunizieren zu können, als auch über ein Bewusstsein, dass und welche Kinder über diesen Kanal besser kommunizieren können, können Peer-Interaktionen trotz unterschiedlicher Ausgangsbedingungen besser zugänglich werden.

Dies umfasst erstens, dass allen Kindern Gebärden aus der nationalen Gebärdensprache angeboten werden und zwar unabhängig davon, wie ikonisch sie sind. So kann die Gebärden(sprach)kompetenz lebenslang mit gebärdensprachkompetenten Menschen – beispielsweise aufgrund von Taubheit oder Schwerhörigkeit, wegen Familienangehöriger oder anderer Personen im Umfeld mit

Hörbehinderung oder mit aus beruflichen Gründen gebärdensprachkompetenten Menschen – genutzt werden. Unseren Daten zufolge ist es weder nötig noch sinnvoll, für Kinder mit SEND gezielt ikonischere Gebärden anzubieten, da sie diese durchschnittlich tendenziell weniger nutzen als Kinder ohne SEND. Dass ältere Kinder und sich typisch entwickelnde Kinder tendenziell Ikonizität beim Gebärdenerwerb bzw. -lernen nutzen, trägt möglicherweise zu ihrem vergleichsweise erfolgreichen Gebärdenlernverhalten bei, erfordert aber kein spezielles Angebot ikonischer Gebärden, da zur möglichst gleichberechtigten Partizipation von gebärden(sprach)orientierten Kindern an Peer-Interaktionen eher inhaltlich benötigte Gebärden vermittelt werden sollten.

Um das Gebärden(sprach)lernverhalten der Kinder zu optimieren, ist, wie beim Sprachenlernen im Allgemeinen, ein quantitativ häufiger und qualitativ hochwertiger Input nötig (Chilla et al., 2013). Dies kann vor allem durch den Einsatz gebärdensprachkompetenter, möglichst selbst tauber Fachkräfte sichergestellt werden, da die Kommunikation mit ihnen die Gebärdensprachkompetenz der hörenden Fachkräfte sowie der Kinder, die nicht auf ihre Muttersprache „ausweichen“ können, weiter erhöht. Dieses Phänomen ist auch in monomodal-bilingualen Kitas gegenüber Fachkräften, die die Landessprache nicht beherrschen, zu beobachten (Wode, 2009). Sollten hörende Fachkräfte noch nicht oder kaum gebärden(sprach)kompetent sein, sind Weiterbildungsangebote mit einer engen Verschränkung von Input-, Erprobungs- und Reflexionsphasen, Wertschätzung sowie ein gutes Teamklima hilfreiche Faktoren, um die Implementierungsbedingungen zu verbessern. Angesichts des hohen Umfangs an benötigter Weiterbildungszeit, um die Gebärden(sprach)kompetenz der hörenden Fachkräfte auf- und auszubauen sowie der benötigten Zeit, um die Gebärden(sprach)kompetenz der Kinder weiter wachsen zu lassen, ist eine langfristige Planung sinnvoll, damit die bereitgestellten Ressourcen auch längerfristig sinnvoll und effektiv eingesetzt werden.

Eng verbunden mit guten Gebärdenlernvoraussetzungen sind die Bedingungen, die das Gebärdennutzungsverhalten optimieren. Unseren Daten zufolge werden Gebärden für Peer-Interaktionen fast ausschließlich dann genutzt, wenn mindestens ein Kind in der Gruppe ist, das visuell-gestische Kommunikation „braucht“. In unseren Daten konnte dies jeweils bei Kindern beobachtet werden, die einen größeren Gebärden- als Lautsprachwortschatz hatten – darunter ein taubes Kind, ein Kind mit Trisomie 21 und

ein Kind mit Epilepsie, die das Sprachzentrum betraf. Da ein weiteres Kind mit Trisomie 21 ein ähnliches Lernprofil zeigte und die Kinder seiner Gruppe ebenfalls durchschnittlich deutlich mehr Gebärden gelernt hatten als die Kinder der anderen UKfa-Gruppen (Hänel-Faulhaber et al., 2022), kann angenommen werden, dass möglicherweise ein ähnliches Gebärdennutzungsverhalten in der Gruppe hätte beobachtet werden können, sofern auch hier Videodaten erhoben worden wären. Dies müsste allerdings, ebenso wie für Kinder mit anderen Diagnosen, mit größeren homogenen Stichproben in ähnlichen Settings weiter untersucht werden.

Es scheint also für eine verbesserte Partizipation von primär visuell-gestisch kommunizierenden Kindern an Peer-Interaktionen wichtig, effektiv und sinnvoll zu sein, wenn möglichst flächendeckend Kitagruppen eingerichtet werden, die die nationale Gebärdensprache und/oder – je nach Zielgruppe – zentrale Gebärden daraus gleichberechtigt neben der Landessprache bzw. begleitend zur Landessprache anbieten. Diese Gruppen sollten mit in Gebärden(sprache) gut aus- und weitergebildetem, darunter möglichst auch taubem, Personal, längerfristig eingerichtet sein bzw. werden und gezielt für Kinder, die in der visuell-gestischen Modalität besser kommunizieren können, bereitstehen. Dies scheinen unseren Daten zufolge neben vielen tauben und schwerhörigen Kindern auch Kinder mit Trisomie 21 sowie teilweise Kinder mit sprachlichem Förderbedarf aus anderen Gründen – abhängig von der jeweiligen Ursache – zu sein. Da das Erlernen von Gebärden(sprache) sowohl auf Seiten der Fachkräfte als auch auf Seiten der Kinder Zeit benötigt, ist eine langfristige Planung solcher Gruppen sinnvoll und eine gute strukturelle Vernetzung nötig, die sicherstellt, dass möglichst alle Kinder, die von einem solchen Angebot profitieren, Zugang dazu bekommen. Gleichzeitig wird – wo es möglich ist – durch die Aufnahme mehrerer primär visuell-gestisch kommunizierender Kinder in einer Gruppe der Anteil an Kommunikation mit Gebärden(sprache) erhöht, sodass sie wahrscheinlicher für Peer-Interaktionen genutzt und die Partizipationsmöglichkeiten wiederum verbessert werden (vgl. Ardito et al., 2008; Preisler et al., 2002; Spencer et al., 1994). Durch die längerfristige Planung müsste mit der Zeit zudem neben der Gebärden(sprach)kompetenz der Kinder auch die Vertrautheit der Kinder wachsen, was die Interaktionsbedingungen ebenfalls weiter verbessern dürfte (vgl. Kurkjian & Evans, 1988; Lederberg et al., 1986; Rodríguez & Lana, 1996). Kinder, die neu in eine längerfristig bestehende Gruppe kommen, dürften so bereits von Anfang an gute

Voraussetzungen zur möglichst gleichberechtigten Partizipation an Peer-Interaktionen in der visuell-gestischen Modalität vorfinden. So könnten Ressourcen zur Aus- und Weiterbildung in Gebärden(sprachen) effektiv eingesetzt werden.

Neben einzelnen, begleitend zur Lautsprache eingesetzten Gebärden auch Gebärdensprache anzubieten, dürfte neben tauben Kindern auch für schwerhörige Kinder und andere Kinder, die vorwiegend visuell-gestisch kommunizieren, wichtig sein, da nur dadurch eine vollständige visuell-gestisch zugängliche Sprache für Peer-Interaktionen vorhanden ist. So dürfte ein gleichzeitiges Angebot von Gebärdensprache durch taube Fachkräfte sowie von LUG durch hörende Fachkräfte ein Setting mit guten Inputbedingungen sein, wie sie auch von Selbsthilfe- und Fachverbänden von und für Menschen mit Hörbehinderung empfohlen werden (z.B. Bundeselternverband gehörloser Kinder, 2010; DG, 2011). Die konkrete Sprachplanung sollte angepasst an die Bedürfnisse der Kinder der jeweiligen Gruppe erfolgen. Dabei sollte stets berücksichtigt werden, dass durch die „Dominanz“ der Landessprache selbst bei guten Inputbedingungen durch eine taube Fachkraft und durch die Verwendung von LUG durch die hörenden Fachkräfte unseren Daten zufolge auch nach einem halben Jahr kaum Partizipationschancen zur Teilhabe an Peer-Interaktionen für das taube Kind bestanden (Studie 3). Zwar dürfte sich dies, wie eben erwähnt, auch durch langfristige Planung verbessern, da Gebärden(sprach)kompetenz und Vertrautheit der Kinder untereinander wachsen. Dennoch ist auch angesichts der Interaktionsstrukturen in schon länger bimodal-bilingual konzipierten Kitas davon auszugehen, dass der Einsatz weiterer Methoden wichtig und sinnvoll ist, die das Erlernen und die Nutzung von Gebärden(sprache) stärken (Goppelt, 2016). Dies kann beispielsweise durch stille Zeiten, stille Räume oder bestimmte Spiele gestaltet werden (siehe Goppelt, 2015, 2016). Auch sollte regelmäßig durch Diagnostik festgestellt werden, auf welchem Stand die Kinder in beiden angebotenen Sprachen – Lautsprache und Gebärdensprache – sind und welche Maßnahmen daher zu ihrer möglichst gleichberechtigten Partizipation an Peer-Interaktionen sowie an weiteren Prozessen in der Kita, darunter Prozesse demokratischer Partizipation, gegebenenfalls zusätzlich nötig sind (Goppelt-Kunkel & Hänel-Faulhaber, 2022). Dies kann beispielsweise durch die Übersetzung von Inhalten, durch sprachliche Anleitung oder Erläuterung sowie Visualisierung umgesetzt werden (diess.). So können bestmögliche Inklusions- und Partizipationsbedingungen für Kinder mit eingeschränktem Zugang zur

Lautsprache geschaffen werden – wobei die Inklusion in Peer-Interaktionen ihre sozial-emotionale, sprachliche und kognitive Entwicklung weiter fördert und damit auch langfristig ihre Partizipationschancen verbessert.

Kapitel IV

Zusammenfassung und Ausblick

Insgesamt legen unsere Ergebnisse nahe, dass sowohl bestimmte Spielaktivitäten im Freispiel als auch Gebärden(sprachen) als Förderfaktoren für die Teilhabe von Kindern mit (Hör-)Behinderungen und/oder anderweitigem Förderbedarf dienen können. Dies ist jedoch abhängig vom individuellen Förderbedarf und Entwicklungsstand der Kinder, den Weiterbildungsbedingungen für das Team und dem Teamklima, dem Setting und der Gruppenzusammensetzung sowie weiteren Variablen in verschiedenem Maße der Fall.

Unseren Ergebnissen zufolge stellen gerade zuvor häufig als „isoliert“ kategorisierte Spielaktivitäten wie Malen, Basteln oder Puzzeln beliebte Interaktionskontexte für Kinder mit SEND dar, auch untereinander. Dies liegt möglicherweise darin begründet, dass sie weniger hohe Anforderungen an Interaktionskompetenzen der Kinder stellen als beispielsweise Rollenspiele. Dennoch sollten stets auch Spielaktivitäten mit höheren Anforderungen an Interaktionskompetenzen bereitstehen, um allen Kindern die Möglichkeit zu geben, ihre Interaktionskompetenzen weiterzuentwickeln. Für Kinder mit SEND können zusätzlich abhängig von ihren jeweiligen Bedürfnissen weitere Maßnahmen sinnvoll sein, um ihre Teilhabe an Peer-Interaktionen gerade bei Spielaktivitäten mit komplexeren Anforderungen zu verbessern. Hierfür können sowohl Fachkräfte geschult werden, unter anderem hilfreiche Impulse zu geben als auch bei den Kindern mit SEND selbst Kompetenzen ausgebaut werden sowie andere Kinder für die (Interaktions-)Bedürfnisse von Kindern mit SEND sensibilisiert werden. Dabei kann auf vorliegende Daten zurückgegriffen werden, es besteht aber auch weiterer Forschungsbedarf.

Gebärdensprache und lautsprachunterstützend eingesetzte Gebärden können unseren Daten zufolge neben tauben und schwerhörigen Kindern insbesondere für Kinder mit Trisomie 21 und Kinder mit sprachlichem Förderbedarf aufgrund bestimmter Diagnosen, beispielsweise das Sprachzentrum betreffende Epilepsie, die Partizipation an Peer-Interaktionen verbessern. Um diese an einzelnen Kindern beobachteten Effekte mit größeren Stichproben zu validieren sowie gegebenenfalls weitere Diagnosen für ähnliche Gebärdenlern- und -nutzungsprofile ausfindig zu machen, sind jedoch weitere Studien nötig.

Unseren Daten zufolge können und sollten Gebärden für alle Kinder gleichermaßen unabhängig von ihrem Ikonizitätsgrad angeboten werden, da Ikonizität zwar

tendenziell von Kitakindern beim Gebärdenlernen genutzt wird, aber Kinder mit SEND nicht mehr von Ikonizität zu profitieren scheinen als Kinder ohne SEND.

Damit primär in Gebärdensprache oder mit Gebärden kommunizierende Kinder möglichst gleichberechtigt an Peer-Interaktionen partizipieren können, ist die längerfristige und flächendeckende Einrichtung von bimodal-bilingualen Schwerpunktgruppen sinnvoll. In diesen Gruppen sollte mindestens eine, möglichst taube Fachkraft, Gebärdensprache nutzen und mindestens eine hörende Fachkraft in mit Gebärden unterstützter Lautsprache kommunizieren. Wo dies (noch) nicht möglich ist, können Fachkräfte auch über Weiterbildungen in Gebärdensprache und Gebärden geschult werden, die lautsprachunterstützend eingesetzt werden, auch wenn dies selbstverständlich kein vollständiges Sprachangebot für taube Kinder bzw. Kinder ohne Zugang zur Lautsprache darstellt. Solche Weiterbildungen führen unseren Ergebnissen nach insbesondere dann zu einem effektiven Gebärdenlernverhalten der Kinder, wenn die Fachkräfte ausreichenden und berufsbegleitend gut strukturierten Input sowie Wertschätzung erhalten und ein gutes Teamklima besteht.

Damit Gebärden und Gebärdensprachen tatsächlich für Peer-Interaktionen genutzt werden und gleichzeitig die Ressourcen möglichst effektiv eingesetzt werden, sollten möglichst viele Kinder, die primär in Gebärdensprache oder mit Gebärden kommunizieren, in einer solchen Gruppe mit bimodal-bilingualem Angebot oder lautsprachunterstützend eingesetzten Gebärden sein. Hierfür ist eine gute Vernetzung nötig, um die Sorgeberechtigten von Kindern, die von einem solchen Setting profitieren, im jeweiligen Umkreis zu erreichen. Daneben sollte die Nutzung von Gebärden und Gebärdensprache aufgrund der „Dominanz“ der lautsprachlichen Landessprache durch weitere Maßnahmen verstärkt werden, damit ein inklusives Interaktionsfeld entsteht, bei dem auch Kinder mit begrenztem oder ohne Lautsprachzugang von Anfang an möglichst gute Partizipationschancen bei Peer-Interaktionen haben.

Durch den gezielten Einsatz von Spielaktivitäten und Gebärden(sprachen) unter möglichst optimalen Implementierungsbedingungen sowie durch die bedarfsabhängige Ergänzung um weitere Maßnahmen kann ein wichtiger Beitrag zur verbesserten Partizipation von Kindern mit (Hör-)Behinderung und weiteren Förderbedarfen bei Peer-Interaktionen geleistet werden. Somit können bestmögliche

Bedingungen für ihre sozial-emotionale, kognitive und sprachliche Entwicklung bereitgestellt werden.

Da durch die Inklusion von Kindern mit SEND in Peer-Interaktionen wiederum ihre Entwicklung im sozial-emotionalen, kognitiven und sprachlichen Bereich gefördert wird, dürften die so jeweils eingesetzten Ressourcen – wie auch viele Studien zu Langzeiteffekten früher Peer-Interaktionen zeigen – effektiv investiert sein, um die Partizipations- und Inklusionschancen von Kindern mit SEND nachhaltig zu erhöhen.

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SUPPLEMENTARY MATERIAL

Supplementary Material A: A translation of the educator questionnaire is provided here. The questionnaire contains questions regarding demographic information and three sections assessing vocabulary (Part 1), grammar (Part 2), and communication (Part 3). Part 1 to 3 are not analyzed for the purpose of this paper and therefore, not presented here.

(Paper 1)

Questionnaire on child language development

(for educational professionals)

General information

Child's name: _____

Gender: ☐ girl ☐ boy

Date of birth: ____ /____ /_____

Today's date: ____ /____ /_____

Name of kindergarten:

Name of kindergarten group:

Does the child receive any special educational support/therapy? ☐ yes ☐ no

If YES, please provide details in keywords:

Has the child been diagnosed with permanent hearing loss? ☐ yes ☐ no

If YES, please provide details below:

	right ear:	*left ear*:
Degree of hearing loss in dB		
Supply with hearing aid (HA) or cochlear implant (CI)	HA ☐ CI ☐ since_____	HA ☐ CI ☐ since_____

Additional information:

Does the child have physical disabilities, chronic diseases or other permanent impairments? ☐ yes ☐ no

If YES, please provide details in keywords:

Does the child grow up multilingual? ☐ yes ☐ no

If YES, please indicate all languages here:

If YES, since when has the child been learning German? *(Example: since 05/2014):*

Important! The assessment should be carried out by a person who has known the child **very well for at least 3 months**. The first and second assessment should be done by the **same person**.

Supplementary Material B: The coding scheme used for video data analyses presented in this paper and instructions for coding. This scheme was motivated by DeLuzio & Girolametto (2011). Please note that additional information in the videos were coded but not analyzed for the purpose of this paper and these categories are, therefore, not presented here.

Coding procedure

The coders coded according to the following instructions:

Start the movie at minute 30 with the play button. Create an event with the buttons "start new event" or "end this event" (starting and ending an event can also be done using the space bar: press once to start and once to end): Events start and end according to the attention criterion. If the focus child turns its attention to another child/an educator, the event begins; if it turns its attention to something/someone else, the event ends.
If the focus child speaks (e.g. when painting, playing, building) but no one responds, it is still an event for this child, which then ends with "ignore".

a. In one-to-one situations, the events can be very long and contain several speech acts; in small group situations, many short events can occur if attention frequently switches from one cooperation partner to another.
b. If a long interaction is interrupted because someone from outside interrupts two children playing, for example, the event of the originally interacting children ends here and a new event with the person who has joined them begins. The new event ends when the new person leaves or the focus child turns their attention away from the distraction. If the two children then resume the original interaction, a new event is created again. If the focus child does not respond to the distraction at all, but their original interaction partner does, the original event also ends, but without the focus child immediately starting a new one. The focus child then has no event until its interaction partner "comes back to it" or it starts another interaction.
c. Ongoing events are not interrupted because a group member joins, because the context changes during the event or because the behavior of the professional changes, as long as the interaction between the focus child and the interaction partner continues. At the end, the new group members must be added, the context is selected so that it matches the main part of the event and several codes can be selected for the behavior of the professional.
d. Through joint interaction, the children involved have an event at the same time. If you later change the focus child, the shared events should be transferred from the first focus child to the new focus child based on the times so that the events match. To do this, an event is created and the coding chain is processed. The time is then entered manually according to the event for the first focus child. Caution: Do not simply transfer interaction partners etc., as this new event is a mirror image.

Once an event has been created, the coding chain is processed (selection can be made either with the mouse or with a keyboard shortcut):

	Class	Code	Explanations/ Examples
1	**Child**	Code of the child in focus	
2	**Play Activity**	Block building	
		Romping/dancing/gymnastics	
		Reading aloud	
		Role play	
		Panting/crafting/puzzling	
		Board/rule game	
		Exploring a toy	
		Conversation	
		Setting up/removing/putting away	
		Resting/lying down	
		Moving through the room	
		Other	
3	**Interaction partner**	Code of the child	Code of the direct interaction partner, whose interaction with the child in focus produced the interaction if this partner is a child.
		Code of the educator	Code of the direct interaction partner, whose interaction with the child in focus produced the interaction if the partner is an educator.

As soon as the coding chain for the selected event is complete, the window with the codes for the focus children opens. Next, a new event must be created for the focus child, then the coding chain for the new event is run through again from the beginning by clicking on the code for the focus child.
The coding for a focus child ends at minute 40 of the recording. Events that start before minute 40 and would go beyond minute 40 end at minute 40 and are coded in this way. For the next focus child, the corresponding coding is started in the next set.

Coding comparison for focus children that are difficult to code: Mark the children and have them recoded by the other coder to compare the kappa values and correct them if necessary.

Appendix

The rating procedure for the degree of iconicity of the analyzed signs and its results are provided here.

Iconicity Rating Procedure

The 40 signs that were part of the questionnaire (see Supplementary Material A) and of the 232 signs of the material for the educators and the children (for an example, see Figure 1) were selected. These 40 signs consisted of 11 nouns, 9 verbs, 11 adjectives, and 9 words of other types. For determining their degree of iconicity, 180 hearing students were asked to rate the signs via an online questionnaire. At the beginning, normal or corrected to normal vision and no prior sign language experience had to be confirmed, otherwise the questionnaire was stopped. To include only participants without knowledge of sign language is consistent with Caselli et al. (2017) for ASL-LEX to avoid biases due to prior knowledge (see Vinson et al., 2008). 147 students (mean age: 28.0 years, range: 19 – 58 years; 109 female, 36 male, 2 diverse) fulfilled the requirements and completed the questionnaire.

Participants were asked to rate the iconicity of the signs on a 7-point Likert scale (1 = not iconic at all; 7 = highly iconic, see Caselli et al., 2017; Vinson et al., 2008). Participants were instructed to choose high values corresponding to a high degree of iconicity if they found that the signs were depicting the shape or action of the referent or meaning very well. By contrast, they should assign low values if they did not see any connection between aspects of the signs and their meaning. Participants were instructed to answer as quickly as possible. After three practice trials that were not included in the analysis, every sign was presented via video with the German translation above. Each sign was produced by a native signer. This was followed by the 7-point Likert scale, which remained on the screen for five seconds. If participants missed answering within this time span, the next item was presented to them. Missing values of this kind (2.94%) were excluded from the analysis.

(Paper 2)

Rated and Analyzed Signs

SIGN *(translation)*	**Degree of Iconicity** Mean/Median	**Degree of Iconicity** Mean/Median (Trettenbrein et al., 2021)	**Acquired by**
ICH *(I/me)*	6.81 / 7	-	62.8%
LEISE *(quiet/silent)*	6.58 / 7	-	36.6%
ESSEN *(to eat)*	6.38 / 7	6.23/7	66.9%
KOPF *(head)*	6.28 / 7	-	2.8%
SEHEN *(see)*	6.28 / 7	-	1.4%
KLEIN *(small)*	6.04 / 6	-	28.3%
SONNE *(sun)*	5.70 / 6	-	33.1%
WARTEN *(wait)*	5.57 / 6	other sign variant	20.7%
MUSIK *(music)*	5.48 / 6	5.97/6.5	26.2%
ZUSAMMEN *(together)*	5.28 / 5	-	13.1%
DRAUSSEN *(outside)*	5.14 / 5	-	11.0%
SCHWER *(heavy)*	5.03 / 5	-	0.0%
JETZT *(now)*	4.96 / 5	-	9.0%
MÜSSEN *(must/need to)*	4.82 / 5	-	0.0%
SUPPE *(soup)*	4.76 / 5	-	0.0%
HEUTE *(today)*	4.46 / 5	-	4.14%
TISCH *(table)*	4.28 / 4	4.37 / 4.5	6.9%
VOLL *(full)*	3.94 / 4	-	0.0%
NOCHMAL *(again)*	3.89 / 4	-	20.7%
GLAS *(glass)*	3.64 / 4	-	5.5%
SPÄTER *(later)*	3.50 / 3	-	9.0%
AUFRÄUMEN *(to tidy up)*	3.31 / 3	2.4 / 2	50.3%
SAUBER *(clean)*	3.26 / 3	-	0.0%
ARBEITEN *(to work)*	3.24 / 3	-	35.2%
FERTIG *(ready)*	3.23 / 3	-	53.1%
MIT *(with)*	3.06 / 3	-	0.0%
MÜDE *(tired)*	3.03 / 3	-	12.4%
MÖGEN *(to like)*	2.99 / 3	-	5.5%
SCHNELL *(fast/quick)*	2.90 / 3	-	2.1%
SCHMUTZIG *(dirty)*	2.88 / 3	-	0.0%
ALLEIN *(alone)*	2.71 / 3	-	4.1%
SCHUHE *(shoes)*	2.64 / 2	-	0.7%
WASSER *(water)*	2.62 / 2	-	2.8%
MEHR *(more)*	2.57 / 2	other sign variant	6.9%
GEBURTSTAG *(birthday)*	2.50 / 2	-	9.7%
WOLLEN *(to want to)*	2.35 / 2	-	2.8%
NASS *(wet)*	2.35 / 2	-	0.0%
FLEISCH *(meat)*	1.88 / 2	-	0.0%
MÄDCHEN *(girl)*	1.81 / 1	1.27 / 1	11.0%
SPIELEN *(play)*	1.80 / 1	-	40.7%

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(Paper 2)

SUPPLEMENTARY MATERIAL

Supplementary Material A: A translation of the educator questionnaire is provided here. The questionnaire contains questions regarding demographic information and three sections assessing vocabulary (Part 1), grammar (Part 2), and an additional section concerning communication that is not analyzed for the purpose of this paper and therefore, not presented here.

(Paper 2)

Questionnaire on child language development

(for educational professionals)

General information

Child's name: _____

Gender: ☐ girl ☐ boy

Date of birth: ____ /____ /_____

Today's date: ____ /____ /_____

Name of kindergarten:

Name of kindergarten group:

Does the child receive any special educational support/therapy? ☐ yes ☐ no

If YES, please provide details in keywords:

Has the child been diagnosed with permanent hearing loss? ☐ yes ☐ no

If YES, please provide details below:

	right ear:	*left ear*:
Degree of hearing loss in dB		
Supply with hearing aid (HA) or cochlear implant (CI)	HA ☐ CI ☐ since_____	HA ☐ CI ☐ since_____

Additional information:

Does the child have physical disabilities, chronic diseases or other permanent impairments? ☐ yes ☐ no

If YES, please provide details in keywords:

Does the child grow up multilingual? ☐ yes ☐ no

If YES, please indicate all languages here:

If YES, since when has the child been learning German? *(Example: since 05/2014):*

If the child grows up multilingual, please note that the information in the following questionnaire only refers to what the child says in **German.** In addition, **signs of German Sign Language** are recorded.

Important! The assessment should be carried out by a person who has known the child **very well for at least 3 months**. The first and second assessment should be done by the **same person**.

Part 1 - Vocabulary

Subsequently, you will find a list of words that young children typically have in their vocabulary.

There are a lot of words listed here as this is a collection of words used by different children and also by children who may be a bit older. So don't worry if the child only speaks a few of these words at this point. Go through the list and tick the words that the child **speaks and/or signs**.
However, only words/signs should be ticked that the child has used more than once and not those that it only repeats or understands. Please also tick words that the child pronounces slightly differently (e.g., “taufen” (German word for "baptize") instead of “kaufen” (German word for "buy") or “daußen" (German word for “outside” but with omitted “r”) instead of “draußen” (German word for “outside”). If the child uses something similar (e.g., "cup" for "glass"), please write that next to the respective entry.

If the child uses both the word and the sign, please tick both.

	speaks	signs		speaks	signs		speaks	signs		speaks
birthday	☐	☐	work	☐	☐	small	☐	☐	to run	☐
girl	☐	☐	to water	☐	☐	to cook	☐	☐	with	☐
to need	☐	☐	to say	☐	☐	outdoors	☐	☐	glass	☐
head	☐	☐	tired	☐	☐	sand	☐	☐	bucket	☐
to eat	☐	☐	ready	☐	☐	later	☐	☐	to like	☐
throat	☐	☐	to laugh	☐	☐	music	☐	☐	clean	☐
towel	☐	☐	to find	☐	☐	lamp	☐	☐	have to	☐
spicy	☐	☐	finger	☐	☐	today	☐	☐	quiet	☐
give a gift	☐	☐	wet	☐	☐	meat	☐	☐	to listen	☐
light	☐	☐	new	☐	☐	umbrella	☐	☐	to fly	☐
to clean	☐	☐	I	☐	☐	more	☐	☐	to play	☐
to taste	☐	☐	nice	☐	☐	ear	☐	☐	now	☐
breakfast	☐	☐	to buy	☐	☐	to lie (down)	☐	☐	paper	☐
dirty	☐	☐	sun	☐	☐	carpet	☐	☐	warm	☐
to cut	☐	☐	to live	☐	☐	fast	☐	☐	to jump	☐
animal	☐	☐	to wait	☐	☐	cloud	☐	☐	to stand	☐
chocolate	☐	☐	table	☐	☐	to wash	☐	☐	tooth	☐
to tidy up	☐	☐	once again	☐	☐	to want	☐	☐	alone	☐
cabinet	☐	☐	stone	☐	☐	tomato	☐	☐	water	☐
toe	☐	☐	shoe	☐	☐	pen	☐	☐	stairs	☐
away	☐	☐	room	☐	☐	heavy	☐	☐	street	☐
full	☐	☐	soft	☐	☐	tongue	☐	☐	to search	☐
to swim	☐	☐	to read aloud	☐	☐	meadow	☐	☐	to see	☐
together	☐	☐	soup	☐	☐					

Part 2 - Grammar

1. Does the child already use word combinations/sentences of two or more words, such as "mommy book", "playing baby" or "Is that going in there?"? ☐ yes ☐ no

If you ticked YES, please answer all subsequent questions. If you ticked NO, please continue to 'Part 3 – communication'.

In the following, always tick the option that **most closely** corresponds to what the child would say.

2.	☐ There cat.	3.	☐ Mommy shopping.	4.	☐ This mine!
	☐ There's a cat.		☐ Mommy is shopping.		☐ This is mine!
5.	☐ Mommy cook.	6.	☐ many car	7.	☐ many flower
	☐ Mommy is cooking.		☐ many cars		☐ many flowers

8. Does the child use the sentence connector **and**? (e.g., "I'll get the book **and** then you read it.") ☐ yes ☐ no

9. Does the child use the words my (grammatical gender male)/my (grammatical gender female) correctly? (e.g., **my** room, **my** doll, **my** toys) ☐ yes ☐ no

10 If the child doesn't want an apple, they're more likely to say:
☐ "Don't eat apple!"
☐ "I don't want to eat an apple!"

Does the child use the question word:

11. **How?** – e.g., "How does this game work?" ☐ yes ☐ no
12. **What?** – e.g., "What have you got there?" ☐ yes ☐ no
13. **Where?** - e.g., "Where's my ball?" ☐ yes ☐ no
14 **To where?** – e.g., "Where is Dad going?" ☐ yes ☐ no

15 Does the child retell short stories/fairy tales (using pictures)? ☐ yes ☐ no

[…]

Supplementary Material B: The classification scheme for defining signs and gestures in our video data is provided here. It was developed according to Fricke (2007, 2012). The signs or gestures were assigned to the respective categories by two hearing advanced signers. Inter-Rater-Agreement was calculated using Cohen´s Kappa (Cohen, 1960) in the R package *DescTools* (Signorell, 2023). Coders showed almost perfect agreement (κ = 0.83, 95% CI[0.77, 0.88]).

Classification of Signs and Gestures in our Data

Abbreviations: DGS = Deutsche Gebärdensprache (German Sign Language)

Category		**Definition**
1	Gesture	Criteria: Fulfillment of 1.1. and, in case of only one parameter deviation from lexicalized signs from DGS, one of the criteria of 1.2
		1.1. The execution differs in at least one parameter from a DGS sign that semantically matches the word or context.
		1.2. If deviating in exactly one parameter, one of the following criteria must apply: 1.2.1. Typical use for referring iconic or deictic gestures (imitation of actions, representation of forms, indication of size, localization in space) 1.2.2. If regarded as referring arbitrary gesture (which is rarely used following Fricke, 2007, p. 218), there must be evidence for their widespread use. 1.2.3. Produced in a typical manner for non-referring gestures (e.g., repetitive strokes to emphasize or change discourse levels, ideographic, performative) (According to the classification scheme of speech-accompanying gestures by Fricke 2007, p. 222)
2	Sign/Gesture	Criteria: 2.1. and 2.2. must be met:
		2.1. A lexicalized DGS sign is produced that deviates in maximum one parameter from the linguistically correct form, but at the same time it corresponds to a common gesture (category 1 of this scheme). Accordingly, at least one of the criteria of 1.2. must apply. 2.2. This does not occur within an interaction in which at least one other sign (category 3) is produced by the same person.

3	Sign	Criteria: One of the following criteria (3.1 to 3.4) must be met:
		3.1. A correctly produced lexicalized DGS sign is used, which does not correspond to any common gesture.
		3.2. A correctly produced lexicalized DGS sign is used that also corresponds to a common gesture according to 1.2, but occurs within an interaction with at least one correctly produced lexicalized DGS sign according to 3.1.
		3.3. A lexicalized sign may not be performed correctly in maximum one parameter, but a gesture is unlikely because none of the criteria of 1.2 applies.
		3.4. A lexicalized sign is produced incorrectly in more than one parameter but is clearly labeled as a sign in context (incorrect production).
4	Number(word)	Numbers are assigned to this category because they are often produced (additionally) in the visual-spatial modality, both as signs and gestures, and to assign them to categories 1 to 3 is particularly difficult. Exception: If a in the visual-spatial modality produced number occurs within interactions with signs from category 3, it is also assigned to category 3.
5	Pronoun	Pronouns are assigned to this category because they are produced not only as signs, but also as gestures often for emphasis additionally in the visual-spatial modality and to assign them to categories 1 to 3 is particularly difficult. Exception: If a in the visual-spatial modality produced pronoun occurs within interactions with signs from category 3, it is also assigned to category 3.
6	Sign in metalinguistic communication	A sign, which does not need to be clearly distinguishable from a gesture, is used or specifically practiced in metalinguistic communication (e.g., looking at sign cards, asking for signs). Hierarchy for assignment: at the top (e.g. if a sign, a number word or a pronoun is used in metalinguistic communication, always 6, not 3, 4 or 5).
7	Sign in song	A sign, which does not need to be clearly distinguishable from a gesture, is used when singing a song. Hierarchy for assignment: at the top (e.g. if a sign, a number word or a pronoun is used in a song, always 7, not 3, 4 or 5).

References:

Cohen, J. (1960). A Coefficient of Agreement for Nominal Scales. *Educational and Psychological Measurement, 20*(1), 37–46. https://doi.org/10.1177/001316446002000104

Fricke, E. (2007). *Origo, Geste und Raum—Lokaldeixis im Deutschen*. De Gruyter.

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Suchodoletz, W. v., Kademann, S., & Tippelt, S. (2011). *Sprachbeurteilung durch Eltern – Kurztest für die U7a (SBE-3-KT). ("Language assessment by parents—Short test for child screening U7a")*. https://www.kjp.med.uni-muenchen.de/download/SBE-3-KT_Handbuch.pdf

Poster:

The data on language development and sign vocabulary for the poster were collected using the same questionnaire as in Paper 2, Supplementary Material A.
The data on sign implementation were collected as described by Schüler et al. (2021).

The signs in the video data were collected during coding as described for Paper 1, Supplementary Material B, using the additional items "sign language active" (if the focus child used at least one sign) or "sign language passive" (if the focus child's interaction partner used at least one sign). Then they were categorized according to the same scheme as in Paper 2, Supplementary Material B, although categories 6 and 7 were combined into "taught or elicited signs."

(Paper 3)

SUPPLEMENTAL MATERIAL

Supplemental Material A: A translation of the educator questionnaire is provided here. The questionnaire contains questions about demographic information about the respective child and four sections assessing vocabulary (Part 1), grammar (Part 2), communicative skills, i.e., pragmatic profile (Part 3) and speech intelligibility and comprehension (Part 4).

(Paper 3)

Questionnaire on child language development

(for educational professionals)

General information

Child's name: _____

Gender: ☐ girl ☐ boy

Date of birth: ___ /___ /_____

Today's date: ___ /___ /_____

Name of kindergarten:

Name of kindergarten group:

Does the child receive any special educational support/therapy? ☐ yes ☐ no

If YES, please provide details in keywords:

Has the child been diagnosed with permanent hearing loss? ☐ yes ☐ no

If YES, please provide details below:

	right ear:	*left ear*:
Degree of hearing loss in dB		
Supply with hearing aid (HA) or cochlear implant (CI)	HA ☐ CI ☐ since_____	HA ☐ CI ☐ since_____

Additional information:

Does the child have physical disabilities, chronic diseases or other permanent impairments? ☐ yes ☐ no

If YES, please provide details in keywords:

Does the child grow up multilingual? ☐ yes ☐ no

If YES, please indicate all languages here:

If YES, since when has the child been learning German? *(Example: since 05/2014):*

If the child grows up multilingual, please note that the information in the following questionnaire only refers to what the child says in **German.** In addition, **signs of German Sign Language** are recorded.

Important! The assessment should be carried out by a person who has known the child **very well for at least 3 months**. The first and second assessment should be done by the **same person**.

Part 1 - Vocabulary

Subsequently, you will find a list of words that young children typically have in their vocabulary.

There are a lot of words listed here as this is a collection of words used by different children and also by children who may be a bit older. So don't worry if the child only speaks a few of these words at this point. Go through the list and tick the words that the child **speaks and/or signs**. However, only words/signs should be ticked that the child has used more than once and not those that it only repeats or understands. Please also tick words that the child pronounces slightly differently (e.g., "taufen" (German word for "baptize") instead of "kaufen" (German word for "buy") or "daußen" (German word for "outside" but with omitted "r") instead of "draußen" (German word for "outside"). If the child uses something similar (e.g., "cup" for "glass"), please write that next to the respective entry.

If the child uses both the word and the sign, please tick <u>both</u>.

	speaks	signs		speaks	signs		speaks	signs		speaks	signs
birthday	☐	☐	work	☐	☐	small	☐	☐	to run	☐	☐
girl	☐	☐	to water	☐	☐	to cook	☐	☐	with	☐	☐
to need	☐	☐	to say	☐	☐	outdoors	☐	☐	glass	☐	☐
head	☐	☐	tired	☐	☐	sand	☐	☐	bucket	☐	☐
to eat	☐	☐	ready	☐	☐	later	☐	☐	to like	☐	☐
throat	☐	☐	to laugh	☐	☐	music	☐	☐	clean	☐	☐
towel	☐	☐	to find	☐	☐	lamp	☐	☐	have to	☐	☐
spicy	☐	☐	finger	☐	☐	today	☐	☐	quiet	☐	☐
give a gift	☐	☐	wet	☐	☐	meat	☐	☐	to listen	☐	☐
light	☐	☐	new	☐	☐	umbrella	☐	☐	to fly	☐	☐
to clean	☐	☐	I	☐	☐	more	☐	☐	to play	☐	☐
to taste	☐	☐	nice	☐	☐	ear	☐	☐	now	☐	☐
breakfast	☐	☐	to buy	☐	☐	to lie (down)	☐	☐	paper	☐	☐
dirty	☐	☐	sun	☐	☐	carpet	☐	☐	warm	☐	☐
to cut	☐	☐	to live	☐	☐	fast	☐	☐	to jump	☐	☐
animal	☐	☐	to wait	☐	☐	cloud	☐	☐	to stand	☐	☐
chocolate	☐	☐	table	☐	☐	to wash	☐	☐	tooth	☐	☐
to tidy up	☐	☐	once again	☐	☐	to want	☐	☐	alone	☐	☐
cabinet	☐	☐	stone	☐	☐	tomato	☐	☐	water	☐	☐
toe	☐	☐	shoe	☐	☐	pen	☐	☐	stairs	☐	☐
away	☐	☐	room	☐	☐	heavy	☐	☐	street	☐	☐
full	☐	☐	soft	☐	☐	tongue	☐	☐	to search	☐	☐
to swim	☐	☐	to read aloud	☐	☐	meadow	☐	☐	to see	☐	☐
together	☐	☐	soup	☐	☐						

Part 2 - Grammar

1. Does the child already use word combinations/sentences of two or more words, such as "mommy book", "playing baby" or "Is that going in there?"? ☐ yes ☐ no

If you ticked YES, please answer all subsequent questions. If you ticked NO, please continue to 'Part 3 – communication'.

In the following, always tick the option that **most closely** corresponds to what the child would say.

2. ☐ There cat.
   ☐ There's a cat.

3. ☐ Mommy shopping.
   ☐ Mommy is shopping.

4. ☐ This mine!
   ☐ This is mine!

5. ☐ Mommy cook.
   ☐ Mommy is cooking.

6. ☐ many car
   ☐ many cars

7. ☐ many flower
   ☐ many flowers

8. Does the child use the sentence connector **and** ? (e.g., "I'll get the book **and** then you read it.") ☐ yes ☐ no

9. Does the child use the words my (grammatical gender male)/my (grammatical gender female) correctly? (e.g., **my** room, **my** doll, **my** toys) ☐ yes ☐ no

10. If the child doesn't want an apple, they're more likely to say:
    ☐ "Don't eat apple!"
    ☐ "I don't want to eat an apple!"

Does the child use the question word:

11. **How?** – e.g., "How does game work?" ☐ yes ☐ no
12. **What?** – e.g., "What have you got there?" ☐ yes ☐ no
13. **Where?** - e.g., "Where's my ball?" ☐ yes ☐ no
14 **To where?** – e.g., "Where is Dad going?" ☐ yes ☐ no

15 Does the child retell short stories/fairy tales (using pictures)? ☐ yes ☐ no

Teil 3 - Communication

In the following you will read selected statements on children's communication behavior. In each case, please assess to what extent these behaviors apply to the child. Tick the correct statements for each answer. **Multiple ticking is possible** if the child shows several of the behaviors.

1. If you try to help the child with something they want to do on their own, e.g., getting dressed, how does the child react?

   ☐ The child cries and squirms.
   ☐ The child gets angry.
   ☐ The child pushes you away and tries to do it on her/his own.
   ☐ The child produces signs like "No!" or "Alone!".
   ☐ The child says something like: "Myself!", "Me!" or "Alone!".
   ☐ The child says something like, "I want to do this alone!".
   ☐ The child signs something like, "I want to dress myself!"
   ☐ The child uses a combination of signs and words to express herself/himself.

2. If you sit at the table and give the child something to eat that the child doesn't want, how does the child react?

   ☐ The child is crying.
   ☐ The child turns away or contorts the face.
   ☐ The child pushes the food away.
   ☐ The child shakes her/his head.
   ☐ The child produces the sign "No!".
   ☐ The child says: "No!".
   ☐ The child says something like: "Bah!", "Don't want to!" or "Don't like!".
   ☐ The child signs something like: "Disgusting!" or "Don't want to!"
   ☐ The child uses a combination of signs and words to make herself/himself understood.

3. If the child sees something that the child wants but can't get hold of, what does the child do?

   ☐ The child is crying.
   ☐ The child points to it.
   ☐ The child points to it, reaches for it and makes pleading noises.
   ☐ The child pulls you towards what it wants or pushes your hand in the right direction.
   ☐ The child looks or points at what it wants and produces a sign, e.g., the sign for “car” or "have".
   ☐ The child will show you a picture card with the corresponding icon, e.g., a car.
   ☐ The child calls you.
   ☐ The child looks or points to what it wants and says something like, "Car!" or "Have!".
   ☐ The child says something like: "I want the car.".
   ☐ The child signs something like, "I want the car."
   ☐ The child uses a combination of signs and words to make herself/himself understood.
   ☐ The child gets angry or distressed but does not ask for help.
   ☐ The child waits passively.

4. When the child is with other children, how does the child participate in play?

   ☐ The child plays alone.
   ☐ The child plays alongside the other children.
   ☐ The child watches the other children.
   ☐ The child takes adult guidance and involvement to participate.
   ☐ The child is talking to another child.
   ☐ The child signs with another child.
   ☐ The child uses a combination of signs and words to communicate.

5. If you ask the child to do something, e.g., "Please get your shoes!", what does the child do?

   ☐ The child shows no reaction.
   ☐ The child looks at you questioningly but doesn't seem to know what to do.
   ☐ The child does when it is part of a constant routine.
   ☐ The child will do what you ask if you show her/him the appropriate picture card.
   ☐ The child executes your request when you support your request with signs and pointing.
   ☐ The child carries out your request.

6. You and the children are walking along a road. Suddenly, the child sees something that interests her/him, such as an excavator. How does the child react?

☐ The child points to it.
☐ The child pulls or taps you and then points at it.
☐ The child points to it and says something like: "There!" or "Look!".
☐ The child points to it and produces a sign, e.g., the sign for “excavator”.
☐ The child says a word, e.g., "Excavator!".
☐ The child combines a word and a sign, e.g., the child says "There!" and produces the sign for " excavator".
☐ The child starts talking about it.
☐ The child starts signing about it.
☐ The child doesn't try to draw your attention to what is interesting.

Teil 4 – Speech intelligibility und speech comprehension

1. How intelligible is the child's speech to people who do not know them well?
   Give an approximate estimate in percentage, with 100% meaning "very well understood", 0% meaning "unintelligible" and e.g., 50% meaning "about half understandable". You can indicate any whole number from 1 to 100.
   _____%

2. How well does the child understand age-appropriate statements at a normal volume within a noise level that is normal in kindergarten groups?
   Give an approximate estimate in percentage, where 100% means "understands statements immediately", 0% means "does not understand statements" and e.g., 50% means "does not understand about half of the statements right away". Again, you may use all full numbers from 1 to 100 .
   _____%

Own observations/comments in connection with sign language in the kindergarten:

Thank you for your participation!

Supplemental Material B: Overview of demographic information for children in the inclusive groups from Schüler et al. (2021) and our co-enrollment group. The table provides information about gender, therapy, language, and SBE-3-KT score.

Group	**Gender**		**Therapy**		**Language**		**SBE-3-KT score**
	Girls	Boys	Yes	No	Mono-lingual	Bi-lingual	(Mean)
1 - Low implementation (n = 144)	63 (43.8%)	81 (56.2%)	27 (18.8%)	117 (81.2%)	79 (54.9%)	65 (45.1%)	141.7
2 - High implementation (n= 145)	70 (48.3%)	75 (51.7%)	31 (21.4%)	114 (78.6%)	85 (58.6%)	60 (41.4%)	136.1
3 - Co-enrollment (n = 11)	4 (36.3%)	7 (63.6%)	3 (27.3%)	8 (72.7%)	8 (72.7%)	3 (27.3%)	131.2

Supplemental Material C: The coding scheme used for video data analyses presented in this paper. This scheme was motivated by Preisler et al. (2002) and Schulz (2016). Please note that additional information in the videos were coded but not analyzed for the purpose of this paper and these categories are, therefore, not presented here.

	Class	**Code**	**Explanations/Examples**
1	**Child**	Code of the child in focus	
2	**Interaction partner**	Code of the child	Code of the direct interaction partner, whose interaction with the child in focus produced the interaction if this partner is a child.
		Code of the educator	Code of the direct interaction partner, whose interaction with the child in focus produced the interaction if the partner is an educator.
3	**Modality active**	Spoken language	Only spoken language is used, i.e., no signs used at all.
		Sign language	Only sign language is used, i.e., no spoken language used at all.
		Code-Blending	When spoken language and sign language are used at the same time (even if it occurs only once, i.e., a single sign accompanied by a spoken word in a longer stretch of signs or vice versa).
		Code-Switching	When switching from spoken language to sign language or vice versa.
		Nonverbal	If no lexicalized signs or words are used.
3a	**Additional modality active**	also Code-Blending	If spoken language and sign language are also used at the same time (even if it occurs only once).
		also Code-Switching	When switching also from spoken language to sign language or vice versa.
		No	If only one code applies in 3.

	Class	Code	Explanations/Examples
4	**Modality passive**	Spoken language	Only spoken language is used, i.e., no signs used at all.
		Sign language	Only sign language is used, i.e., no spoken language used at all.
		Code-Blending	When spoken language and sign language are used at the same time (even if it occurs only once, i.e., a single sign accompanied by a spoken word in a longer stretch of signs or vice versa).
		Code-Switching	When switching from spoken language to sign language or vice versa.
		Nonverbal	If no lexicalized signs or words are used.
4a	**Additional modality passive**	Also Code-Blending	If spoken language and sign language are also used at the same time (even if it occurs only once).
		Also Code-Switching	When switching also from spoken language to sign language or vice versa.
		No	If only one code applies in 4.

Zusammenfassung

Interaktionen mit Gleichaltrigen spielen von früher Kindheit an eine Schlüsselrolle für viele Entwicklungsbereiche. Studien zeigen, dass sie sich auf die sozial-emotionale Entwicklung, die sprachliche Entwicklung sowie die kognitive Entwicklung von Kindern auswirken. Selbst im Jugend- und Erwachsenenalter sind die Effekte der Quantität und Qualität früher Peer-Interaktionen noch deutlich messbar: Sie beeinflussen das Selbstwertgefühl, die soziale Akzeptanz und die Fähigkeit zur Beziehungsgestaltung im weiteren Leben sowie mittel- und langfristig das Risiko für Depressionen. Deshalb ist es von großer Bedeutung, dass Kinder von Anfang an möglichst barrierefrei und gleichberechtigt an solchen Peer-Interaktionen, beispielsweise in Kindertageseinrichtungen (Kitas), teilhaben können.

Kinder mit besonderem Förderbedarf und/oder Behinderungen (Special Educational Needs and/or Disabilities, kurz: SEND) sind besonders gefährdet, aus Peer-Interaktionen ausgeschlossen zu werden. Als eine besonders ressourcenschonende und effektive Maßnahme zur Erhöhung der Teilhabe an Peer-Interaktionen hat sich die Variation ökologischer Einflussfaktoren wie Spielmaterialien erwiesen. Jedoch lagen bislang vor allem Ergebnisse aus experimentellen Studien vor, deren Befunde sich nicht mit denjenigen aus den wenigen dazu durchgeführten Studien in natürlichen Settings decken. So wurden in experimentellen Studien Spielmaterialien zum Malen, Basteln oder Puzzeln als „isoliert“ identifiziert, also als Kontexte, in denen Kinder mit SEND eher alleine spielen. Spielmaterialien zum Bauen oder Rollenspiel hingegen wurden auf Basis experimenteller Studiendaten als „sozial“ mit mehr Interaktionspotential kategorisiert. Die wenigen kleineren Studien im natürlichen Setting bestätigten dies jedoch nicht oder nur für einzelne Kinder, zeigten aber auch nicht das Gegenteil. Deshalb untersuchten wir im Rahmen der ersten hier beschriebenen Studie in inklusiven Kitagruppen, inwieweit sich die Interaktionen von Kindern mit und ohne SEND im Freispiel unterscheiden und ob dies von Spielaktivitäten abhängt. Dabei interessierte uns auch, ob Kinder mit oder ohne SEND abhängig vom Spielkontext Interaktionspartner:innen mit oder ohne SEND wählen. Hierfür wurden zum einen mit Fragebögen demografische Daten der Kinder erhoben. Zum anderen wurden Videodaten im Freispiel aufgenommen und kodiert. Bei der Analyse der Daten zeigte sich, dass Kinder mit SEND konsistent mit dem Forschungsstand tendenziell weniger mit Gleichaltrigen und signifikant mehr mit Fachkräften interagierten als Kinder ohne SEND. Die Interaktionen von Kindern mit SEND fanden signifikant häufiger als bei Kindern ohne SEND in Kontexten statt, die in experimentellen Studien als „isolierte“ Spielaktivitäten kategorisiert worden waren. Zudem spielten Kinder mit SEND bei diesen

„isolierten“ Spielaktivitäten zu einem signifikant höheren Anteil mit Kindern mit SEND als mit Kindern ohne SEND. Bei Kindern ohne SEND konnten wir diesbezüglich keine Unterschiede feststellen. Dies deutet darauf hin, dass möglicherweise gerade Spielaktivitäten, die auf Grundlage experimenteller Studien als „isoliert“ galten, für Kinder mit SEND eine besonders wichtige Ressource darstellen könnten, da sie weniger komplexe Interaktionskompetenzen erfordern, als dies beispielsweise beim Rollenspiel der Fall ist. Möglicherweise können sie auch als Ausgangspunkt dienen, um Interaktionskompetenzen gerade von Kindern mit SEND weiter auszubauen. Auch wenn unsere Studie Kinder mit SEND als eine Gruppe behandelt hat und dadurch weiterer und differenzierterer Forschungsbedarf besteht, legt sie nahe, dass diese „isolierten“ Kontexte als mögliche Förderfaktoren zur Erhöhung der Teilhabe von Kindern mit SEND besondere Berücksichtigung in Wissenschaft und Praxis finden sollten.

Betrachtet man die Art des Förderbedarfs und ihre Auswirkungen differenzierter, so hat sich gezeigt, dass neben weiteren Faktoren insbesondere sprachliche Kompetenzen in der Landessprache eine wichtige Voraussetzung für den Zugang zu Peer-Interaktionen und für ihr Aufrechterhalten darstellen. Kinder mit Hörbehinderung beispielsweise haben jedoch akustisch nur eingeschränkt Zugang zur lautsprachlichen Landessprache. Auch Kinder mit einem sprachlichen Förderbedarf aus anderen Gründen sind vom Ausschluss aus Peer-Interaktionen bedroht. Über visuell-gestisch wahrgenommene und produzierte Gebärdensprachen steht jedoch ein weiterer Kommunikationskanal zur Verfügung. Dieser kann von Kindern mit Hörbehinderung barrierefrei genutzt werden – und einigen Studien zufolge können auch Kinder mit sprachlichem Förderbedarf abhängig von dessen Ursache und Ausprägung diesen Kanal zur Kommunikation nutzen. So bietet ein Angebot von Gebärden und Gebärdensprachen in Kitas Kindern mit diesen Voraussetzungen eine Möglichkeit, besser oder überhaupt an Peer-Interaktionen teilhaben zu können. Eine Voraussetzung dafür ist jedoch, dass auch die anderen Kinder der Gruppe ausreichende Gebärden(sprach)kompetenzen erwerben. Hierbei sind viele Fragen offen, zu deren Beantwortung die weiteren Arbeiten dieser Dissertation beitragen sollen.

Eine dieser Fragen ist, welche Faktoren das Erlernen von Gebärden für Kinder in inklusiven Kitas möglicherweise erleichtern können. In älteren Publikationen war beispielsweise auf Basis kleinerer Studien angenommen worden, dass Kinder mit bestimmten Förderbedarfen ikonische, also bildliche, Gebärden schneller erlernen. Inwieweit die Ikonizität von Gebärden eine Rolle beim Lernverhalten von Kindern mit und ohne Förderbedarf spielt, hat zum einen praktische Konsequenzen für das Angebot von Gebärden beispielsweise in inklusiven Kitas und Frühförderung beziehungsweise ob und inwieweit Ikonizität dabei berücksichtigt werden sollte. Zum anderen bieten visuell-räumlich vermittelte Gebärdensprachen einen deutlich größeren

Anteil an Lexemen mit hoher Ikonizität als Lautsprachen und stellen so ein hilfreiches Forschungsmedium zur Beantwortung der Rolle von Ikonizität im Allgemeinen dar. Deshalb haben wir im Rahmen der zweiten Studie untersucht, inwieweit das Alter, der Sprachentwicklungsstand oder der Förderbedarf von Kindern beeinflusst, ob sie mehr oder weniger ikonische Gebärden lernen. Hierfür wurden mit Hilfe von Fragebögen demografische Informationen, der lautsprachliche Sprachentwicklungsstand sowie der Gebärdenwortschatz von Kindern mit und ohne SEND in inklusiven Kitagruppen erhoben, denen seit einem halben Jahr Gebärden von ihren Erzieher:innen angeboten wurden. Wir fanden heraus, dass insbesondere ältere Kinder mehr ikonische Gebärden erlernten als jüngere. Kinder mit SEND erlernten hingegen durchschnittlich nicht mehr ikonische Gebärden als Kinder ohne SEND. Diese Beobachtungen deuten darauf hin, dass vor allem altersbedingte Reifungsprozesse eine Rolle für die Nutzung von Ikonizität spielen, während der Sprachentwicklungsstand weniger ausschlaggebend ist und Kinder mit SEND insgesamt nicht mehr von Ikonizität zu profitieren scheinen als Kinder ohne SEND. Unseren Daten zufolge erscheint ein Anbieten von Gebärden unabhängig von ihrem Ikonizitätsgrad für Kinder mit und ohne SEND sinnvoll.

Daneben untersuchten wir weitere Faktoren, die beeinflussten, inwieweit Kinder mit und ohne SEND in inklusiven Kitas nach einer Schulung ihrer Erzieher:innen Gebärden erlernten – und inwieweit sie Gebärden für Peer-Interaktionen nutzten (Poster). Dies wurde wiederum mit Fragebogen- und Videodaten im Freispiel untersucht. Dabei fanden wir heraus, dass für das Erlernen von Gebärden insbesondere ihre regelmäßige Anwendung im Alltag durch die pädagogischen Fachkräfte als auch ein fortgeschrittener Sprachentwicklungsstand der Kinder in der Landessprache wichtige Förderfaktoren darstellten. Eine Nutzung von Gebärden bei Peer-Interaktionen hingegen konnte vor allem in einer Kindergartengruppe beobachtet werden, in der ein Kind mit Trisomie 21 einen deutlich größeren Gebärden- als Lautsprachwortschatz aufwies. In den anderen Kitagruppen hingegen wurden Gebärden den Videodaten zufolge auch eineinhalb Jahre nach Interventionsbeginn kaum bei Peer-Interaktionen genutzt.

Angesichts dieser Daten stellt sich die Frage, wie sich das Gebärdenlern- und Nutzungsverhalten bei höherem Gebärdeninput und -bedarf gestaltet. Zwar liegen hierzu für verschiedene Settings für Kinder mit Hörbehinderung Studien vor. Insgesamt ist die Studienlage jedoch dünn und gerade für Kinder mit sprachlichem Förderbedarf ohne Hörbehinderung liegen kaum Daten zum Gebärdenlern- und Nutzungsverhalten bei Gebärdensprachinput (nicht nur dem Verwenden einzelner Gebärden) vor. Deshalb wurde im Rahmen der dritten Studie untersucht, inwieweit Kinder mit und ohne SEND in einer inklusiven Kitagruppe Gebärden erlernten und nutzten, in der seit einem halben Jahr eine taube,

gebärdensprachkompetente Fachkraft arbeitete und in die parallel zu ihrem Arbeitsbeginn auch ein taubes Kind aufgenommen wurde. Das Gebärdenlern- und Nutzungsverhalten der Kinder wurde mit den gleichen, leicht adaptierten Fragebogen- und Videodaten analysiert wie in der zweiten Studie und beim eben erwähnten Poster. Dadurch konnte vergleichend zu den bisher vorgestellten Daten analysiert und festgestellt werden, dass die hörenden Kinder dieser Co-Enrollment-Gruppe nach einem halben Jahr über einen signifikant größeren Gebärdenwortschatz verfügten als die Kinder aus Kitagruppen mit in Gebärden geschulten Fachkräften, selbst wenn sie diese ihren Angaben zufolge in ihren Alltag implementiert hatten. Übereinstimmend mit den anderen Gruppen zeigte sich auch hier die Tendenz, dass die hörenden Kinder mit weiter fortgeschrittenem Sprachentwicklungsstand in der Lautsprache mehr Gebärden erlernt hatten. Ein gegenteiliges Muster zeigte jedoch ein Kind mit Epilepsie, die das Sprachzentrum betraf. Trotz des niedrigsten lautsprachlichen Wortschatzes der hörenden Kinder der Gruppe hatte es einen größeren Gebärdenwortschatz als der Durchschnitt der Gruppe. Während Peer-Interaktionen wurden jedoch auch in dieser Gruppe den Daten zufolge nur vereinzelt Gebärden und Gebärdensprache genutzt. Das taube Kind interagierte überwiegend mit der tauben Fachkraft und nutzte dabei vor allem Gebärdensprache. Bei Interaktionen mit hörenden Kindern und Erzieher:innen setzte es vor allem nonverbale Kommunikation ein. Dies legt nahe, dass auch in einem solchen Setting nach einem halben Jahr (noch) nicht die gleichen Zugangschancen für gebärden(sprach)nutzende Kinder zu Peer-Interaktionen bestehen wie für Kinder mit Zugang zur und altersgemäßer Entwicklung der Landessprache. Neben einem höheren Anteil an gebärdensprachnutzenden Kindern sowie – abhängig vom Betreuungsschlüssel – Fachkräften erscheint für ein solches Setting auch der Einsatz gezielter gebärdensprachförderlicher Maßnahmen wichtig. Zudem ist eine längere gemeinsame Zeit in einem solchen Setting ein wichtiger Faktor, der Vertrautheit und Gebärdensprachkompetenz gleichermaßen fördert.

Zusammenfassend konnten wir feststellen, dass für die Teilhabe von Kindern mit SEND an Peer-Interaktionen unter anderem das Angebot bestimmter Spielaktivitäten einen Förderfaktor darstellen kann (Studie 1). Ein Angebot von Gebärden oder Gebärdensprache wird eher unabhängig von ihrer Ikonizität (Studie 2), aber vor allem abhängig vom Input, dem Sprachentwicklungsstand der Kinder und ihrer Diagnose bzw. ihrem konkreten Förderbedarf angenommen, für Peer-Interaktionen jedoch fast nur genutzt, wenn einzelne Kinder der Gruppe es benötigen – und auch dann ein halbes Jahr nach Implementationsbeginn (noch) eher wenig (Poster und Studie 3). Über die Variation von Spielmaterialien scheint somit für Kinder mit SEND eine ressourceneffektive Erhöhung der Teilhabe an Peer-Interaktionen möglich, während

die visuelle Modalität vor allem dann für Kinder mit eingeschränktem Zugang zur Lautsprache eingesetzt werden kann, wenn mehrere Kinder sie vorrangig nutzen und bei guten strukturellen Rahmenbedingungen längerfristig und bedarfsangepasst geplant wird.

Summary

Interactions with peers play a key role in many areas of development from an early age. Studies show that they have an impact on children's social-emotional development, language development and cognitive development. Even in adolescence and adulthood, the effects of the quantity and quality of early peer interactions are still clearly measurable: they influence self-esteem, social acceptance and the ability to form relationships in later life, as well as the risk of depression in the medium and long term. It is therefore of great importance that children are able to participate in such peer interactions, for example in daycare centers, as barrier-free and equal as possible right from the start.

Children with special educational needs and/or disabilities (SEND) are particularly at risk of being excluded from peer interactions. Varying ecological factors such as play materials has proven to be a particularly resource-saving and effective measure for increasing participation in peer interactions. However, to date, results have mainly been available from experimental studies, the findings of which are not consistent with those from the few studies conducted in natural settings. In experimental studies, play materials for painting, crafting or doing puzzles were identified as “isolate”, i.e. as contexts in which children with SEND tend to play alone. Play materials for building or role play, on the other hand, were categorized as “social” with more interaction potential based on experimental study data. However, the few small studies in natural settings did not confirm this, or only for individual children, but did not show the opposite either. Therefore, as part of the first study in inclusive daycare groups described here, we investigated the extent to which the interactions of children with and without SEND differ during free play and whether this depends on play activities. We were also interested in whether children with or without SEND choose interaction partners with or without SEND depending on the play context. To this end, we collected demographic data from the children using questionnaires. Secondly, video data was recorded and coded during free play. The analysis of the data showed that, consistent with the current state of research, children with SEND tended to interact less with their peers and significantly more with teachers than children without SEND. The interactions of children with SEND were significantly more frequent than those of children without SEND in contexts that had been categorized as “isolate” play activities in experimental studies. Furthermore, in these ‘isolate’ play activities, children with SEND played with children with SEND at a significantly higher rate than with children without SEND. We found no differences in this regard for children without SEND. This suggests that play activities that were considered ‘isolate’ on the basis of experimental

studies may be a particularly important resource for children with SEND, as they require less complex interaction skills than role play, for example. They may also serve as a starting point to further develop interaction skills, particularly for children with SEND. Even though our study treated children with SEND as a group and therefore requires further and more differentiated research, it suggests that these 'isolate' contexts should be given special consideration in science and practice as a possible factor for increasing the participation of children with SEND.

A more differentiated look at the type of special educational needs and their effects shows that, in addition to other factors, language skills in the national language in particular are an important prerequisite for accessing and maintaining peer interactions. However, children with hearing impairments, for example, only have limited access to the spoken national language. Children with speech, language and communication needs (SLCN) for other reasons are also at risk of exclusion from peer interactions. However, visually and gesturally perceived and produced sign languages provide an additional communication channel. This can be used by children with hearing impairments without barriers – and according to some studies, children with SLCN can also use this channel for communication, depending on the individual background. The provision of signs and sign languages in daycare centers therefore offers children with these conditions an opportunity to participate better or at all in peer interactions. However, a prerequisite for this is that the other children in the group also acquire sufficient sign (language) skills. There are many unanswered questions in this regard, which the further work in this dissertation aims to help to answer.

One of these questions is which factors can possibly facilitate the learning of signs for children in inclusive daycare centers. In earlier publications, for example, it was assumed on the basis of small studies that children with certain special educational needs learn iconic signs more quickly. The extent to which the iconicity of signs plays a role in the learning behavior of children with and without SEND has practical consequences for the provision of signs, for example in inclusive daycare centers and early intervention, and whether and to what extent iconicity should be taken into account. On the other hand, sign languages, produced and received in the visual-spatial modality, offer a significantly larger proportion of lexemes with high iconicity than spoken languages and thus represent a helpful research medium for answering the role of iconicity in general. In the second study, we therefore investigated the extent to which children's age, level of language development or need for special educational support influences whether they learn more or fewer iconic signs. For this purpose, questionnaires were used to

collect demographic information, the level of spoken language development and the sign vocabulary of children with and without SEND in inclusive daycare groups who had been offered signs by their teachers for six months. We found that older children in particular learned more iconic signs than younger children. Children with SEND, on the other hand, did not learn more iconic signs on average than children without SEND. These observations suggest that age-related maturation processes play a role for exploiting iconicity, whereas language development is less important and children with SEND do not appear to benefit more from iconicity than children without SEND. According to our data, the provision of signs appears to be beneficial for children with and without SEND regardless of their level of iconicity.

We also investigated other factors that influenced the extent to which children with and without SEND in inclusive daycare centers learned signs after a training modul for their teachers – and the extent to which they used signs for peer interactions (poster). This in turn was investigated using questionnaire and video data during free play. We found that the regular use of signs in everyday life by the teachers and the children's advanced level of language development in the national language were particularly important factors for learning signs. The use of signs in peer interactions, on the other hand, was primarily observed in one kindergarten group in which a child with down syndrome had a significantly larger sign language vocabulary than spoken language vocabulary. In the other daycare groups, however, the video data showed that signs were hardly used in peer interactions, even one and a half years after the start of the intervention.

In view of this data, the question arises as to how sign learning and use behavior develops with higher sign input and demand. There are studies on this for various settings for children with hearing impairments. Overall, however, the study situation is sparse and there is hardly any data on sign learning and use behavior with sign language input (not just the use of individual signs), especially for children with SLCN without hearing impairment. For this reason, the third study investigated the extent to which children with and without SEND learned and used sign language in an inclusive daycare group in which a deaf teacher with sign language skills had been working for six months and in which a deaf child was admitted at the same time as she started work. The children's sign learning and use behavior was analyzed using the same, slightly adapted questionnaire and video data as in the second study and the aforementioned poster. In comparison to the data presented so far, it was possible to analyze and determine that the hearing children in this co-enrollment group had a significantly larger sign vocabulary after six months than the children from daycare groups with teachers trained in signs, even if they had implemented them in their everyday lives

according to their own statements. Consistent with the other groups, there was also a tendency here for the hearing children with a more advanced level of language development in spoken language to have learned more signs. However, a child with epilepsy, which affected the speech center, showed the opposite pattern. Despite having the lowest spoken language vocabulary of the hearing children in the group, it had a larger sign vocabulary than the average of the group. During peer interactions, however, the data also showed that this group only occasionally used signs and sign language. The deaf child mainly interacted with the deaf teacher and primarily used sign language. In interactions with hearing children and teachers, it mainly used non-verbal communication. This suggests that even in such a setting, after six months, children who use sign language do not (yet) have the same opportunities to access peer interactions as children with access to and age-appropriate development of the national language. In addition to a higher proportion of children who use sign language and - depending on the childcare ratio – teachers who use sign language, the use of targeted measures to support sign language also seems to be important for such a setting. In addition, spending more time together in such a setting is an important factor that promotes familiarity and sign language skills.

In summary, we conclude that the provision of certain play activities, among other things, can be a support factor for the participation of children with SEND in peer interactions (Study 1). An offer of signs or sign language tends to be accepted regardless of its iconicity (Study 2), but above all depending on the input, the children's level of language development and their diagnosis or specific educational needs, but is almost only used for peer interactions when individual children in the group need it - and even then (still) rather little six months after the start of implementation (Poster and Study 3). By varying play activities, it therefore seems possible for children with SEND to increase their participation in peer interactions in a resource-effective way, while the visual modality can be used primarily for children with limited access to spoken language if several children use it as their predominant mode of communication as well as if the structural framework conditions are good and the planning is long-term and needs-based.

Eidesstattliche Versicherung

Ich, Madlen Goppelt-Kunkel, versichere an Eides statt, dass ich die Dissertation mit dem Titel: „Interaktionen von Kindern mit und ohne (Hör-)Behinderung in inklusiven Kindertageseinrichtungen mit und ohne Gebärden(sprache)“ selbst verfasst und keine anderen als die angegebenen Hilfsmittel benutzt habe.

Hamburg, den 14.5.2025 — Ort, Datum

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Erklärung

Darüber hinaus erkläre ich, dass ich keine kommerzielle Promotionsberatung in Anspruch genommen habe und die Arbeit nicht schon einmal in einem früheren Promotionsverfahren angenommen oder als ungenügend beurteilt worden ist.

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