Communication Interventions Targeting Theory of Mind in Deaf and Hard of Hearing Children

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Introduction

The development of a "Theory of Mind" (ToM) enables children to understand that mental states can explain why others do and say things and is an important milestone in children's lives. Young children will break into the puzzle of communication and language by using aspects of their ToM. They will use ToM to navigate the complex scenarios they will encounter in the school and eventually children will rely on ToM to build their wider social networks. In this chapter we will outline what ToM is and what it enables children to discover. We focus on the development of ToM in deaf children and how fully-developed ToM reasoning has several antecedent steps involving wider social-cognitive abilities. Any disruptions to the development of ToM have serious consequences. Deaf and hard of hearing (DHH) children are at particular risk of being behind in the development of ToM skills compared to hearing peers. We argue the reason for these delays is that social-cognitive competencies are closely linked to communication and language acquisition (spoken language and/or sign language) and especially DHH children's participation in communicative interactions.

In the second half of the chapter we concentrate on research that has shown that intervention programs may result in improvements in ToM. We describe in detail one such evidence-based training program: The Mind Readers (Becker *et al.,* 2021). The aim of this intervention is to promote ToM skills and emotion understanding, as well as related sign and spoken language skills (at the word/sign, syntax, and conversation levels) in DHH children and

young people. It has a modular design that is theory-based and follows empirically tested developmental steps. It is multilingual with different spoken and sign languages and combines various methodical approaches to accommodate diversity among children. It can be implemented as a prevention or intervention in individual or classroom sessions. Interventions should be based on evidence from research. In the following section we describe research on ToM development.

1. Building a Theory of Mind

Much research has investigated ToM in typical development (Premack and Woodruff, 1978; de Villiers and Pyers, 2002; Milligan, Astington and Dack, 2007) and in DHH children (Peterson and Siegal, 1995; Woolfe, Want and Siegal, 2002; Schick, *et al.*, 2007; Becker, Hansen and Barbeito-Rey, 2018; Kelly, *et al.*, 2019). ToM encompasses a set of abilities that serve broadly "social-cognitive" functions for the child, social in the sense that ToM is implicated in how successfully children interact with others in social events (e.g., playing together). For this reason, many researchers argue ToM is a product of social interaction (Carpendale and Lewis, 2004; Buttelmann, Carpenter and Tomasello, 2009).

As well as the social aspect, ToM involves a "cognitive" element, meaning ToM allows children to reason that people's actions (e.g., laughing) have a mental or cognitive origin (e.g., my friend is laughing because tomorrow they are going to the cinema). Having a ToM facilitates the child's calculation of what others are thinking about. Psychologists distinguish two related abilities in ToM: explicit (deliberate) and implicit (automatic) (Heyes and Frith, 2014). Over the past 35 years, researchers have investigated the development of explicit ToM reasoning (e.g., being able to declare that a person laughs because they are thinking about a future fun event, and this makes them happy). More recent research is uncovering an earlier automatic appreciation of mental states by infants in more implicit situations (Onishi and Baillargeon, 2005). For example, toddlers will spontaneously open a door for an adult whose

hands are full. They have some appreciation of the adult's intentions without being explicitly told or being able to express their appreciation explicitly in words. In both areas of ToM development there has been a general pattern of delays and disruptions reported for children born DHH (e.g., Meristo *et al.*, 2012; O'Reilly, Peterson and Wellman, 2014; Kelly *et al.,* 2019). Any delays to ToM development can have negative consequences for a wide range of linked functions, including language, social and academic development (Peterson, Wellman and Liu, 2005; Morgan, 2015; Marschark *et al*., 2019).

1.1 Explicit Reasoning about Minds

The word "Theory" in ToM, suggests the child has declarative knowledge of thoughts, feelings, desires, beliefs (the contents of the Mind) and can reason with this knowledge to understand and predict the behaviour of others. For example, a child infers that the happy expression on her friend's face means that she is excited and looking forward to something. The child reasons that this is connected to her friend's birthday party tomorrow where they will be going to the cinema. This level of understanding is linked to the child doing some verbal reasoning (Pyers and de Villiers, 2013) or what Vygotsky termed inner speech (Vygotsky, 1986). Verbal reasoning requires the child to reflect on the contents of one's own and other's minds using language; e.g., "she is laughing because she is happy about going to the cinema tomorrow". It is possible that reasoning with inner speech might be difficult in children who have delayed language development, (Vissers, Tomas and Law, 2020).

In the past, researchers argued ToM emerged in typically developing children between 4-5 years of age (Wimmer and Perner, 1983; Baron-Cohen, Leslie and Frith, 1985; Bosco and Gabbatore, 2017). At this age, children were able to use their understanding of other's minds (they had developed a theory) to verbally reason through problems, i.e., answer a question on the Sally Anne test (Wimmer and Perner, 1983): if Sally did not see that her ball was moved to

a new location by Anne, then where will she look for it when she comes back? The correct answer involves the understanding of false beliefs; Sally will look where she originally left it and not where it has been moved to. Typically developing children start to answer this correctly around the age of 4 years, and the ability to reason about a false belief (FB) is considered a major milestone in early cognitive development (Wimmer and Perner, 1983).

However, many researchers and parents know that children behave like they understand the minds of others at an earlier age than 4 years (Tomasello, 2008). What children are able to do at 4 years of age is the result of many earlier coalescing developments. FB understanding is only one part of ToM, with varying concepts or scales emerging at different times before and after this milestone. For example, the child might first discover that their own desires can differ from those of other people and then the child can recognize that another person's beliefs can differ from their own and indeed be false (Peterson, Wellman and Liu, 2005). While many DHH children have delays in ToM development, it appears they follow the same order of scaled abilities that have been reported for hearing children (Peterson, Wellman and Liu, 2005).

1.2 DHH Children's ToM Reasoning

Many studies have documented that being born DHH can disrupt the development of explicit ToM abilities for up to several years, which leads to negative consequences for a wide range of related functions, including social, academic and language skills (Peterson, Wellman and Liu, 2005; Morgan, 2015; Marschark, *et al.*, 2019). Delays in ToM have been found especially with the 90-95% of DHH children who are born into hearing families that know very little about deafness and signed language when their child is born (Mitchell and Karchmer, 2004). There is a range of explanations offered for ToM difficulties in DHH children. Some studies have linked delays in ToM to late vocabulary learning (especially

mental state vocabulary, e.g., think, know, wonder) (Milligan, Astington and Dack, 2007). However, there is also the chance ToM delays are linked to more fundamental aspects of language that are in turn linked to the development of communicative interaction. A popular account of word learning is the social-pragmatic approach, which argues children use flexible and powerful social-cognitive skills to grasp the communicative intentions of others using words in interactive situations (Tomasello, 1992). One of the main skills highlighted in this framework is child and parent sharing their attention and communication, termed joint attentional engagement. Indeed, in the context of DHH children with hearing parents, one of the main difficulties hearing parents report is the establishment of successful joint attention with their DHH infants. In contrast to DHH parents (Lieberman, *et al.*, 2014; Kelly, *et al*., 2020), hearing parents often struggle to attract and maintain their DHH child's attention for long enough to provide meaningful linguistic (communication with symbols) input (Spencer and Lederberg, 1997). As a result, hearing parents tend to be less successful at creating episodes of joint attention which are embedded in symbolic communication, termed symbol-infused joint attention (Prezbindowski, Adamson and Lederberg, 1998; Gale and Schick, 2008).

1.3 Implicit Understanding of ToM

The role of joint attention links to an implicit version of ToM which develops prior to ToM through verbal reasoning. Currently, it is suggested by several researchers that ToM emerges within an earlier period, possibly in the first year, and then continues to emerge slowly thereafter. As a result of this standpoint, researchers now include a less explicit understanding of mental states in the ToM developmental trajectory. Children initially have a more intuitive or implicit appreciation of the mental states of others, on which they can base their reactions. For example, Buttelmann, Carpenter and Tomasello (2009) demonstrated that eighteen-

month-old infants show implicit understanding of intention in an active helping task. The scenario the children witnessed was where somebody carries a handful of books into a room and is not able to open a cupboard (their hands are not free) to put down the books. The 18-month-olds spontaneously react to this and try to help by opening the cupboard for the book carrier. There have been very few studies of implicit ToM abilities in DHH children. One exception is Meristo *et al.* (2012), who compared DHH (all with hearing parents) and hearing 24-month-olds on a ToM task which requires the child to look towards a location, in anticipation of where an event will unfold. The anticipatory look is directed by the child's appreciation of the mental state of the character in the task (a false belief). Hearing infants significantly outperformed their DHH counterparts in anticipating the search actions of a cartoon character that held a FB . Subsequently, Meristo and Strid (2020) demonstrated DHH infants with DHH parents had no difficulties with this task, thus appearing to have access to implicit ToM abilities. These findings support the argument that access to quality early interaction contributes to early ToM reasoning in both DHH and hearing children. Implications therefore, are that early interventions by professionals need to take into consideration the communicative interactions in the period between birth and two years. Rather than focus on language development per se, professional support should also include strategies for parents to engender the development of reciprocation, joint attention and implicit understanding of intentions (e.g., Roberts, 2018; Kelly *et al*., 2022).

Thus, early social interaction forms the basis of ToM and language abilities that will emerge in the first two years of life. For example, in a longitudinal study Nelson, Adamson and Bakeman (2008) analysed the relationship between hearing toddlers' joint engagement and their development of ToM when they were preschoolers. Higher preschool FB scores were associated with more time in coordinated joint engagement and symbol-infused joint engagement as toddlers. Nelson, Adamson and Bakeman (2008) argued that the foundation of

ToM development is laid early as toddlers attend to both social-emotional and symbolic aspects of shared events.

In terms of early shared communication, DHH children with hearing families show particular delays in establishing successful interaction. Mothers of DHH children use less complex utterances, suggesting reduced symbol-infused joint engagement (Moeller and Tomblin, 2015). Perhaps this is related to reduced responsiveness as mothers report anxiety and feelings of incompetence in how to interact with a DHH child. A second area linked with ToM development in DHH infants is the amount of connected talk the child experiences. Fagan, Bergeson and Morris (2014) found that mothers of DHH children use more directives (e.g., let go, come here) and prohibitions (e.g., no, don't touch) than mothers of age-matched hearing children, suggesting reduced social-emotional foundations. Finally, Morgan *et al.* (2014) recorded conversations between hearing mothers and their hearing and DHH toddlers in both the UK and Sweden. Mothers of DHH children used far fewer words for mental states, like "remember, know, and think", in their conversations. Presumably, mothers were adjusting the complexity of their vocabulary to the language level of their DHH child. In addition, hearing-DHH dyads' conversations had less communicatively effective turn-taking than those between hearing mothers of hearing children. This meant DHH toddlers had less opportunities to learn about mental state vocabulary in shared communicative interactions. These patterns were seen across two different cultures and indicate that conversations differ significantly for young DHH children in those aspects of social-cognition thought to be crucial for later explicit ToM development.

2. Later ToM Abilities

When more explicit reasoning appears, it is also the case that there is a spectrum of abilities children need to develop. Wellman and Liu (2004) put forward a five-stage ToM scale which begins with (i) children first acquiring knowledge about the mind through an understanding

of desires ("I like, she likes, wants, doesn't like" etc.), then (ii) diverse beliefs (thinking differs across people), followed by (iii) an understanding of knowledge and ignorance (e.g., seeing leads to knowing, not seeing leads to not knowing), then (iv) false ideas/beliefs, and finally (iv) children gain an understanding of hidden emotions (e.g., "she is pretending to be sad").

Peterson and Wellman (2009) went on to investigate the same ToM scale in 93 children (33 DHH; 60 hearing) aged 3 to 13 years who were tested on a set of six ToM tasks. The results showed that DHH children were substantially delayed in the chronological age at which they passed the tests compared to hearing children, especially in understanding pretending and FB, and this was correlated with the deaf children's delays in social pretend play (see also Sidera, Morgan and Serrat, 2020). Importantly, Peterson and Wellman (2009) report that both DHH and hearing groups progressed through the same sequence, in the same order, albeit at different ages. Finally, hearing parents of young DHH adults report specific problems with their children's understanding of nonliteral speech (see Gregory, Bishop and Sheldon, 1995). O'Reilly, Peterson and Wellman (2014) confirmed this, with DHH participants having delayed understanding of sarcasm into adulthood. Finally, Kelly *et al.* (2019) found that DHH children with hearing parents were delayed on the understanding of an honest versus a deliberate mistake.

In explaining how DHH and hearing children develop these later ToM abilities, we can look at research that argues it is the experience of conversations that triggers these developments. This experience of being involved in a conversation might be indirect; e.g., hearing others offer explanations for white lies (a harmless or trivial deception, especially one told to avoid hurting someone's feelings). Involvement in a conversation can also be direct participation in shared reflection of what it means to understand or misunderstand. The conversation perspective emphasizes that DHH children might have differences in early communicative

experiences compared with hearing children (Rinaldi *et al.*, 2013). The argument is most DHH children experience limited access to conversations involving real-world ToM-related scenarios compared to typically hearing children (Jeanes, Nienhuys and Rickards, 2000; Most, Shina-August and Meilijson, 2010; Rinaldi *et al.*, 2013; Meristo, Strid and Hjelmquist, 2016). In the context of understanding ToM reasons for lying, Kelly *et al.* (2019) write that conversational experience could be effective in three specific ways. First, it could promote the understanding that interlocutors have contrasting perspectives and motives. Second, conversations could provide incidental exposure to lies and mistakes. Third, conversations could include explicit metalinguistic talk about lying (or being mistaken) and the intentions behind it.

In support of this argument, the small group of DHH children with DHH parents appears, at least in the early stages of ToM development, to follow a standard rate and patterns of growth (Courtin, 2000; Woolfe, Want and Siegal, 2002; Lieberman *et al*., 2014; Brooks, Singleton and Meltzoff, 2020; Meristo and Strid, 2020). These DHH infants experience early social-communicative interactions that sow the seeds of ToM development.

Interim summary: Earlier developing abilities in social cognition coalesce by 4 years of age in typically developing hearing children to produce a ToM(s). While there is much variability linked to early experiences (especially parent hearing status), many DHH children exhibit delays in demonstrating both implicit and explicit ToM. Explanations for how ToM develops stem from the explicit role of language to the wider functions of social interaction. In the case of DHH children with hearing parents, there are often disruptions to the establishment of social exchanges and shared knowledge. Explicit ToM enables older children to appreciate sarcasm, lies and conflicting perspectives. It is apparent that DHH children have marked

difficulties in these areas that are linked to both mental state vocabulary and verbal reasoning, as well as different experiences of conversations about the mind.

It is therefore the task of professionals working with DHH children and their families to counteract possible delays and enhance not only language acquisition but also ToM. First of all, it is important to create the communicative conditions as early as possible in the family and educational settings so that children can develop ToM in social interaction. Second, communication interventions targeting ToM can prevent what? Or support DHH children to catch up with peers.

3. Training Theory of Mind in Deaf and Hard of Hearing Children

3.1 Interventions targeting Theory of Mind

Research has demonstrated that explicit training of ToM concepts can be effective (e.g., Wellman and Peterson, 2013; Sprung *et al.*, 2015; Hofmann *et al.*, 2016). However, the available ToM training programs are not specifically designed for DHH children. Lecce and Bianco (2018), for example, developed a training program based on stories followed by questions to stimulate mental state conversations in groups and language exercises focusing on mental state verbs. The authors showed the training to be effective in a study with hearing children aged 8-10 years and published the training in Italian (Bianco, Lecce and Banerjee, 2015). In addition, some evidence-based ToM training programs are available in the context of autism. These include the intervention guide by Howlin, Baron-Cohen and Hadwin (1998) and a workbook by Hadwin, Howlin and Baron-Cohen (2015), which is published in English. In German there is also the therapy program TOMTASS targeting children at the age of 9-11 years (Paschke-Müller *et al*., 2013). In these last two interventions, the focus is on stories that inspire children and young people to talk about the mind.

In addition, there are intervention programs on social and emotional learning that contain support units that take ToM skills into account. One of these is the PATHS curriculum

(Promoting Alternative Thinking Strategies, https://pathsprogram.com/), a preventive intervention program to improve children's social-emotional competence at the age of 4-11 years, that was successfully tested also with DHH children at school-age (Greenberg and Kusché, 1998). This curriculum is available in English and French.

Finally, the Mind Readers training program is, to our knowledge, the only publicly available training for ToM specifically designed for DHH children that considers different spoken and signed languages. We will therefore present it in more detail in the next section.

3.2 The Mind Readers Program

A partnership of researchers and schools in Germany, Greece, Cyprus and Switzerland created the Mind Readers training package, aimed at promoting ToM and emotion understanding in DHH children (Becker *et al*., 2021).[1] It was developed in cooperation with hearing and DHH researchers and teachers through scientific testing in special schools and inclusive settings and is evidence-based. The Mind Readers training is multilingual and can operate with different spoken and signed languages. [2.] It combines various methodical approaches (see section 3.2.2 in this chapter) to accommodate diversity among DHH children. It can be implemented as prevention or intervention in individuals or classroom sessions. It is available via a website (https//:www.protom-education.com) where all materials and information can be downloaded and used free of charge. It is therefore easily accessible for language therapists, teachers, educators, psychologists and social workers. In addition to the training package, the website contains a toolbox for professionals and parents that provides information on the acquisition of ToM and its interaction with language acquisition, how to carry out the training, signs for emotions and mental concepts, and tips

[1] The project was funded from 2018 to 2021 by the European Union (Erasmus+) and Movetia and was awarded the “Erasmus+ Quality Label 2021" and the "European Language Label 2022".

[2] The training is available in German - German Sign Language / Swiss German Sign Language, English - British Sign Language, Greek - Greek Sign Language, French - French Sign Language, Italian - Italian Sign Language and the copyright regulations allow it to be translated into further languages. All exercise files are available as Word or PowerPoint files that can be edited.

for everyday interactions about mental states in families and schools (see section 3.2.4 in this chapter).

3.2.1 Targets and Theoretical Approach

The Mind Readers program focuses on explicit ToM abilities and aims to help children better understand their own mental states as well as those of other people, and to take these into account in social interaction. The training also supports the development of emotion understanding as a part of ToM, as well as the related sign or/and spoken language skills (on word/sign, syntactic, and conversational levels; see explanations below) in DHH children and young people. As the focus is on later ToM skills, the training program is aimed at children aged 5-6 years and older, and is also suitable for children and young people with developmental delays. To our knowledge, it is the only ToM training specifically designed for DHH children and publicly available to educators and teachers.

The Mind Readers program follows the theory of a scaled model of ToM proposed by Peterson, Wellman and Liu (2005) and Pons, Harris and de Rosnay (2004). It covers five developmental stages of later ToM (see section 2 this chapter) and nine components of emotion understanding. Emotion understanding refers to the ability to recognize, name and understand emotions, and encompasses the knowledge of one's own emotions and those of other people. The basic skills are acquired successively and in a partly overlapping sequence in childhood, between the ages of 3 - 9 years (Pons, Harris and de Rosnay, 2004). This same developmental sequence also occurs when there are delays in development in DHH children (Peterson Wellman and Liu, 2005; Wiefferink *et al.*, 2013). The Mind Readers is based on the same sequential development of ToM and emotion understanding. Therefore, it contains nine modules that are designed to follow the developmental stages according to Peterson, Wellman and Liu (2005) and Pons, Harris and de Rosnay (2004). Since the acquisition of the

nine components of emotion understanding overlaps in parts, some exercises can also be carried out in parallel across several modules and exercises in a way that builds on each component:

1. *Recognition of emotions:* to recognize and name feelings

2. *External causes of emotions*: to know that external causes can trigger emotions

3 *Remembering*: to understand that memories of past events and situations can cause emotions

4. *Desires*: to recognize that people have desires that can differ from their own and that these can cause emotions

5. *Beliefs:* to know that people can a) have different access to knowledge, b) have different beliefs and c) have false beliefs that can cause emotions)

6. *Hiding emotions*: to understand that people can hide their true emotions and know why they may do so

7. *Regulation of emotions* (to have strategies at hand to control and regulate one's own feelings and to reflect on the advantages, disadvantages and possible consequences of these strategies in different situations)

8. *Mixed emotions* (to know that people can have mixed emotions which can be ambivalent)

9. *Morality* (to understand that moral values can influence emotions).

As the development of ToM is closely linked to language acquisition, the program also promotes associated language skills in spoken and sign languages. Firstly, the training provides various opportunities for rich symbol-infused conversations and interactive situations in which the mental states of others are organized by themes. Another focus is on the mastery of words and/or signs for naming mental concepts (e.g., adjectives like *happy, uncertain, embarrassed*; verbs like *to know, to think, to guess;* or nouns like *secret, idea, feeling*) and of complex sentences with verbs of saying, thinking and wishing as these have

been identified as some of the drivers for the development of ToM skills (e.g., Schick *et al.*, 2007; Remmel and Peters, 2009). The special feature of these complex sentences (e.g., *The mother thinks that her daughter is doing her homework*) is that the whole sentence can be true even though the complementary sentence (*her daughter is doing her homework*) may be false.

3.2.2 Structure and Methodological-Didactical Approach

The Mind Readers program is structured in nine modules that target individual developmental stages or components of ToM, as described previously. An additional module, "Language," contains more advanced and explicit exercises to practice vocabulary and grammatical structures and can be done alongside the other modules. The 10 modules include 65 exercises altogether, and professionals are guided through the training program with the help of learning objectives. Each module is divided into different learning steps (see table 3.1 for an example), and for each step, professionals can choose between different exercises. This makes it straightforward for them to select exercises that match the developmental levels and needs of the children or young people with whom they work.

Insert table 3.1 here

Each exercise is described in detail with information on level of difficulty, individual teaching steps, material required, how to carry out the exercise, how to conduct the exercise in groups or in 1:1 sessions, and hints on integrated language support. The material to download includes PowerPoint presentations, pictures, sign language videos and worksheets for use in the classroom. The program combines various teaching methods that have proven successful in training studies on ToM and emotion understanding and that promote language

skills in an integrated and explicit way and take into account the diversity of the target group. These teaching methods are described more fully below.

a) Combination of Different Teaching Methods and Materials. *Conversation-based method* (Lecce *et al.*, 2014; Ding *et al.*, 2015; Tompkins, 2015): Stories are used as stimuli for (group) discussions. The professional presents a story using mental-state vocabulary, and guiding questions included in the teachers' material help them to engage children in a discussion after the stories. The inner worlds and mental states of other people and their triggers are addressed, and the protagonists' options for action are discussed.

Sociodramatic play (Qu *et al.*, 2015): Role play is particularly good for getting to know other people's perspectives, feelings and beliefs, and for consolidating the content of a story. Throughout the Mind Readers training, children are guided to take on the role of different characters and to enact their behaviours and emotions in various interactive situations.

Use of thought bubbles (Wellmann and Peterson, 2013; Tucci, Easterbrooks and Lederberg, 2016): Thought bubbles are an important didactic tool as they visually represent what people are thinking or wishing and help children to acquire the concept that people have inner worlds.

Visualisation: Visualisation plays a major role in the training, so that children with poor language skills can also benefit from the training. Pictures, figures and dolls are used to consolidate the understanding of stories and situations. Furthermore, masks (e.g., to symbolise the hiding of emotions) and pictograms (e.g., for different strategies for the regulation of emotions) are used to support explanations.

b) Integrated and Explicit Promotion of Spoken/Written and Signed languages. Some training studies have shown that language exercises (labeling and syntax training) can also support ToM development (Hale and Tager-Flusberg, 2003; Lohmann and Tomasello, 2003; Gola, 2012; Sellabona *et al.*, 2013; Lecce *et al.*, 2014; Durrleman, Dumont and Delage 2021).

For this reason, the Mind Readers program includes three ways to promote the associated spoken/written and/or sign language skills:

- Language promotion is integrated into all exercises as children are involved in rich group or individual conversations about the thoughts, wishes and feelings of themselves and others.
- Vocabulary for expressing mental concepts (recognizing and naming of emotions) is explicitly taught in module 1, and additional and advanced exercises are available in the module "Language".
- The module "Language" also includes exercises that focus on complex sentences with verbs of thinking, wishing and feeling in spoken/written and signed languages. These exercises also build metalinguistic awareness of these constructions.

c) Considering the diversity of DHH children. The teaching methods and materials take special account of the heterogeneous needs of DHH children (e.g., learning requirements, age, culture, educational environment, linguistic orientation).

Multilingualism and delayed language acquisition: Access to different languages is provided, thus taking into account the multilingualism of DHH children. The exercises can also be adapted to different language skills and preferences. Professionals can decide, for example, to tell a story in a spoken language or in a sign language, to use pictures to complement it, to have the students read the story themselves, to show a sign language video, or to enact the story as a role play. Since the same exercises are available in different spoken/written and signed languages, they allow language comparisons and are also suitable for bilingual teaching.

Different learning requirements: The modular structure allows the program to be used flexibly and to consider different knowledge levels of DHH children. First, professionals can

start with the module that corresponds to the child's ability level. Second, the structuring of each module into different learning objectives allows small steps, which can be especially beneficial for children with developmental delays. Third, in order to achieve a learning goal, various exercises are offered. The professional can decide if a child needs only one exercise or if several exercises are needed to achieve progress. To facilitate the selection of exercises, exercises are assigned the labels "beginners" and "advanced".

Different ages: the program can be used preventively, but also as an intervention in case of developmental delays. For this reason, exercises and materials for different age groups are provided in all modules. For example, within the same exercise, different stories and pictures are provided for the professional to choose from, based on the experiences of younger children or adolescents.

Cultural diversity: The Mind Readers program takes into account cultural diversity, which is reflected in the content of the stories and the design of the images.

Flexibility: A central principle of The Mind Readers is that professionals themselves can adapt materials to the needs of the children. All materials are downloadable not only as PDF files, but also as Word or PowerPoint files. Professionals can therefore very easily, for example, replace individual words, sentences or sign language videos, translate entire texts into other languages, or substitute images that are more suitable for their target groups.

3.2.3 How to use The Mind Readers

During development, the training was field tested twice with DHH children and young people aged 6-17 years in schools in Germany, Greece, Cyprus and Switzerland. It was tested at special education schools and mainstream schools both in class groups and as individual support. The following information is based on the experience gained during this trial phase.

Who is the training aimed at? The training is aimed at children of later preschool and elementary school age and also older children and adolescents who exhibit developmental

delays. It can provide preventive support at earlier ages or be used as an intervention. The Mind Readers can be used to support DHH children as well as hearing children because of its multilingual nature, visual didactics and the different language levels of the materials. This makes it suitable for use in inclusive settings where DHH and hearing children learn together. For the selection of modules and exercises when working with an individual child or a group, professionals must take into account the developmental milestones of ToM that are known from research. Professionals are recommended to record children's social-cognitive development through using tests of ToM skills (e.g., Peterson, Wellman and Liu, 2005) or by observations. When conducting observations, The Mind Readers provides a checklist of developmental steps to help professionals to reflect on the developmental stage of a child.

Who can carry out the training? It is recommended that professionals with an educational or psychological background, including teachers, language therapists, educators, school psychologists and social workers, carry out The Mind Readers. Due to the modular structure of the training, working in (interdisciplinary) teams and combining group exercises with individual support is also recommended.

In which settings can the training take place? The Mind Readers can be conducted in a group setting or a 1:1 setting. In the exercise description, it is noted if and how adjustments can be made for a 1:1 session. The advantage of group training is that different perspectives can be experienced, which supports ToM acquisition. If the training is conducted in 1:1 sessions, it is recommended to invite friends or classmates from time to time to do some of the exercises together with other peers. The training can be used under different teaching conditions. It can be embedded into the normal curriculum in mainstream and special schools. For example, the exercises can be used in language lessons or in curriculum topics that specifically target personal, emotional and social development. It is also possible to

deliver the program in individual support sessions inside or outside the classroom (e.g., language therapy).

What should be the duration of the training and how long is an exercise? The development of ToM takes time, especially for children with developmental risks. It is recommended that training is delivered regularly over a longer period of several weeks; e.g., 2-3 exercises per week over a period of 6-8 weeks. Since children need time to reach the next stage of development, it can be useful to spread training over longer periods of time (e.g., two blocks of several weeks in the course of a school year). It is also recommended to work in sessions lasting 45-90 minutes. The amount of time needed for each exercise depends on the individual children. Therefore, no time limit is given in the training instructions for each exercise.

3.2.4 ToM Toolbox

In addition to the training, the website contains a toolbox with information for professionals and parents. Professionals can inform themselves about the theoretical basis and find useful tips for the implementation of The Mind Readers. They can read this information on the website or download the manual. A study on deaf children's access to mental state talk in early life indicates that hearing mothers tend to have less conversations about inner worlds and use less mental state language (Morgan *et al.*, 2014). For this reason, the toolbox contains educational material for parents, as well as guidance and recommendations for holding conversations, reading picture books, and playing games to playfully support ToM development in everyday life. In addition, as professionals and parents are often second language learners of sign language, vocabulary is provided in different sign languages for differentiated naming of mental concepts and feelings.

3.2.5 Research evaluating the Program

The training program was evaluated in two trial phases during its development in schools in Greece, Germany, Cyprus and Switzerland (Becker *et al.,* 2021). A total of 125 DHH children participated in the trial phases and the evaluation. In this field experiment, DHH and hearing professionals (teachers, educators, therapists, social workers) were first trained to use the program and then delivered the training over a period of eight weeks (two sessions per week). To evaluate the program, the teachers and children were questioned qualitatively about each exercise with the help of self-observation (evaluation journals after each exercise), questionnaires and focus group interviews. In addition, a quasi-experimental pre- and post-design was used to check the effectiveness of the training. For this purpose, the participating children were randomly divided into intervention and control groups and tested before and after the trial phases on their ToM abilities and their emotion understanding. The training program was revised after the first as well as the second trial phase according to the results of the qualitative and quantitative evaluation. The qualitative results show a high level of teacher and child satisfaction with The Mind Readers. Teachers observed increases in competence in both ToM and mental language. The quantitative data indicate that children with lower ToM and language skills especially benefit from the training. The field study in different countries and under different conditions (special schools, mainstream schools, group and 1:1 sessions) was mainly aimed at optimising the training in the developmental phase. Further controlled studies are needed in the future to verify the effectiveness of the final version of the training.

4. Summary and Outlook

As DHH children are at particularly high risk of delays in demonstrating implicit and explicit ToM, supporting the development of these skills as well as precursor skills needs to be an integral part of DHH children's support and education. There have been some recent attempts

to train hearing parents in early communication with DHH infants (Roberts, 2018; Kelly *et al*., 2022; Lederberg, this volume), which may also have a positive impact on implicit ToM skills. The Mind Readers training program is so far the only published training program on explicit ToM we know of that takes into account the special needs of DHH children and is available in different spoken/written or sign languages. It can be used flexibly in different learning and therapy situations and is suitable for teaching and individual support in school as well as for use in the context of language therapies and the promotion of social-emotional competence.

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Table 3.1: Learning objectives of module 6 "Hiding Emotions"

Module 6: Hiding Emotions
Overall learning objective: *The students learn that there can be a discrepancy between emotions felt on the inside and emotions shown on the outside and that people can hide their inner feelings on purpose.* This goal can be achieved in three steps: The students learn to: 1. Understand that there can be a discrepancy between emotions felt on the inside and emotions shown on the outside and that people can hide their feelings. 2. Put on different outward expressions to hide the actual felt emotion for different purposes and reasons, and learn that in some situations it is good to “clear the air” and in other situations, it is good to hide emotions. 3. Realise that people can hide not only their emotions but their thoughts and beliefs by showing a behaviour that is different from their inner state.