Being deaf at the playground: the effects of hearing loss on children's social participation
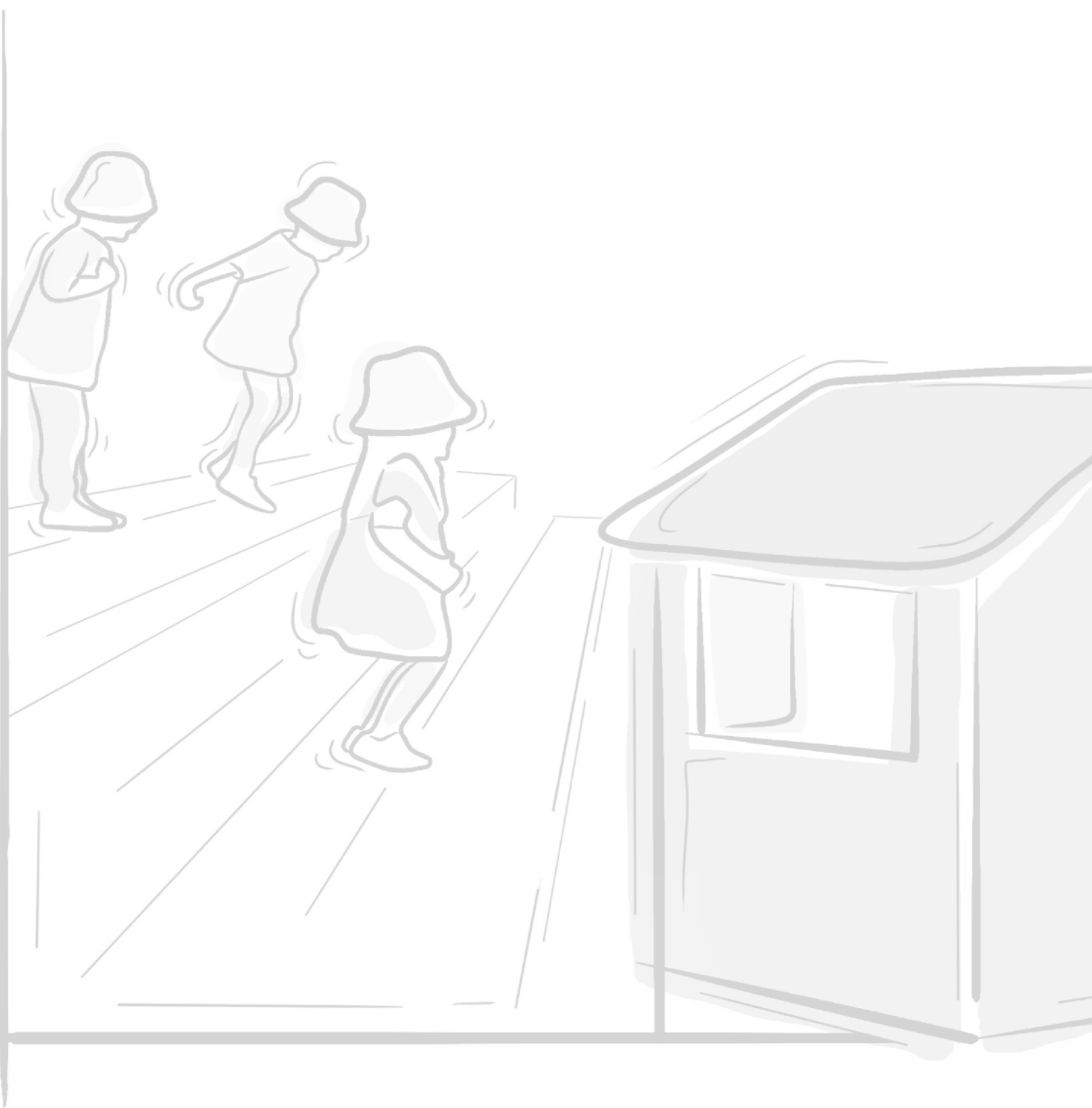de Sousa Da Silva, B.M.

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Chapter 9

General Discussion
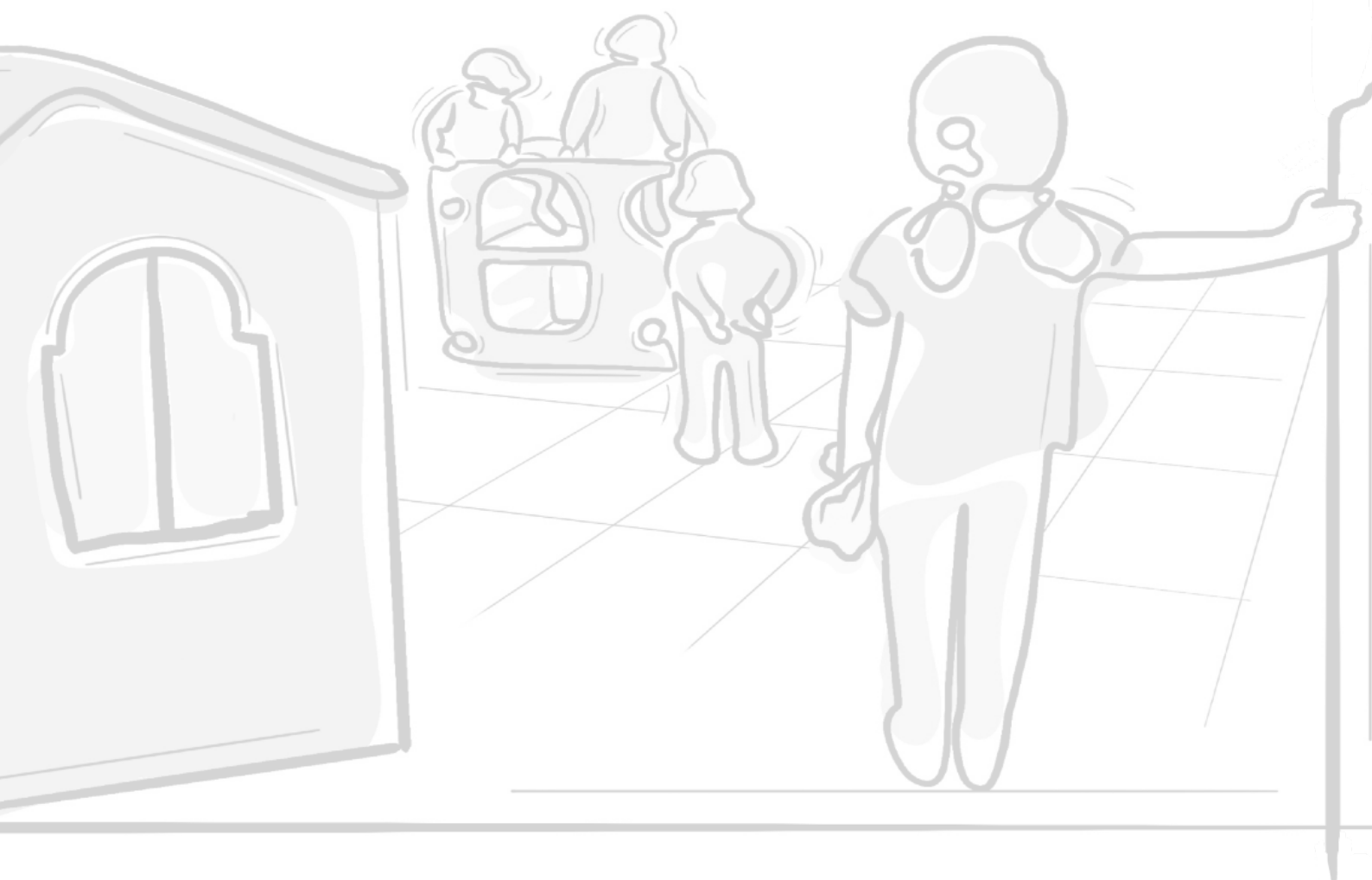
The aim of the current thesis was to understand the social functioning of Portuguese DHH preschool children in the context of their peer group. More specifically, we aimed to understand differences and similarities in the social behaviours of DHH and hearing preschoolers in the playground setting, and how these behaviours relate to children's intrinsic factors (i.e., socioemotional and language skills) and extrinsic factors (i.e., physical and social environment). Understanding the factors that contribute to DHH children's social functioning can better guide us towards creating a more equitable environment that allows these children to feel welcomed, safe, and happy within their peer group.

A common image that arises with the word 'playground' is that of children exploring, observing others, running around while chasing one another, play-fighting while pretending to be super-heroes, discussing things that they like with their peer group, laughing together, and sometimes arguing with each other, yet becoming friends again. Thus, intuitively we understand that playgrounds are important for children's development by providing them with opportunities to explore their interests, spontaneously interact with their peers, and make friends that may last into adulthood. Although playgrounds function as a social arena through the different stages of childhood, they are especially important during the preschool years, when children start to gain more interest in their peers (Sullivan, 1953). While for infants most of their development relies on their daily interactions with their caregivers, for preschoolers a large part of their development is shaped by daily social interactions within the peer group – which mostly occur at the playground and other similar informal settings where children can play and interact freely (Bedell & Dumas, 2004; Law, 2002; Saarni, 1999). These interactions – positive or negative – are so important for children's development that research has consistently shown that they are crucial predictors of their overall development and mental health (Ladd, 1999; Malecki & Elliot, 2002).

Although the common positive image of children playing and laughing together at the playground is true for many children, there are children who experience other kinds of social involvement in these settings. In this complex context, some children opt to spend some time solitarily. In line with previous studies (e.g., Antia et al., 1998; Brown et al., 2008; Deluzio & Girolametto, 2011), DHH preschoolers in our research spent more time in solitary behaviours during outdoor time at their preschool playgrounds compared

to their peers, mostly in onlooking behaviours. Importantly, they spent less time in social interaction during their recess time compared to their hearing peers (**chapter 3**). Yet, despite spending more time alone, DHH children also found opportunities for engaging in play — mostly exercise play — to the same extent as their hearing peers (**chapter 3**). This seems to suggest that DHH children join the peer group in ways or at moments when explicit verbal social contact is less important.

Thus, inspired by the social-ecological model by Bronfenbrenner (1979), we discuss the interplay between the characteristics of DHH children and their microsystem. Bronfenbrenner's social-ecological model (1979) describes human development as the interaction of multiple systems surrounding the child, who is at the centre (Figure 1). This innermost circle includes the child's own characteristics, while the microsystem comprises the intervenients of their daily social interactions like family, peers, and school. We will discuss how DHH children's interpersonal characteristics (intrinsic factors) and characteristics of their microsystem (extrinsic factors) relate to their playground behaviours. Understanding the interaction of these different factors may reveal the various layers influencing children's activities on the playground and highlight necessary changes to promote DHH children's participation in peer groups.
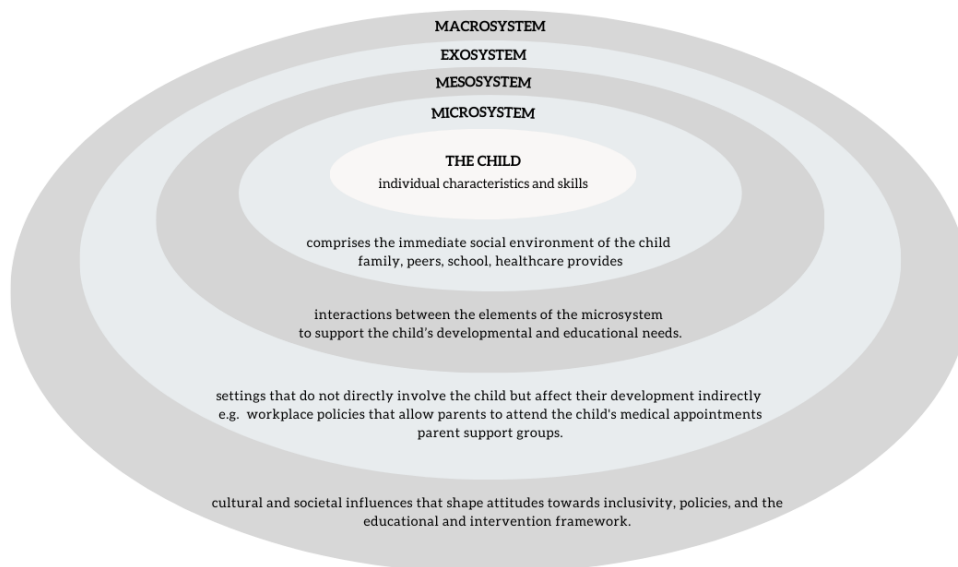

Figure 1. Bronfenbrenner social-ecological model in DHH children

THE INNER CIRCLE - THE DHH CHILD

Social skills

Contrary to what has been shown in previous studies comparing DHH and hearing children or adolescents (Antia et al., 1998; Bat-Chava et al., 2005; Kouwenberg, 2013; Theunissen et al., 2015; Wiefferink et al., 2012), the DHH preschoolers in our studies did not show lower levels of social skills. More specifically, outcomes on measures for externalising problems, aggression and prosocial actions revealed no differences between DHH preschoolers and their hearing peers of the same age **(chapter 5 and 8)**. The prevalence of externalizing problems provides insight into children's abilities to interact appropriately with their social environment (Berdan et al., 2008; Olson & Brodfeld, 1991; Witvliet et al., 2009). Externalizing problems can distinctively include actions like reactive aggression, characterized by impulsive responses to perceived threats, and proactive aggression, which involve intentional actions aimed to achieve a goal (Dodge & Coie, 1987; Marcus & Kramer, 2001; Poulin & Boivin, 2000; Skripkauskaite et al., 2015). Prosocial actions, on the other hand, involve behaviours such as sharing, helping, and cooperating, which are aimed towards others and are essential for building positive peer interactions in preschoolers (Eisenberg et al., 2006, 2015; Hoffman, 2001). In our sample, both groups, DHH and hearing, exhibited similar levels of externalizing problems, both types of aggression, and prosocial actions **(chapters 5 and 8)**. Therefore, it seems plausible to assume that differences in playground behaviours were unrelated to a different level of DHH children's social skills compared to their hearing peers.

Social emotions

Contrary to what was found in previous studies (Ketelaar et al., 2013, 2015; Kouwenberg, 2013; Wiefferink et al., 2012), our DHH preschoolers did not differ from their hearing peers regarding social emotions, which were addressed by examining empathy and moral emotions **(chapters 5 and 8).** Empathy allows children to share the feelings of others, pay attention to them, and prompt them to be engaged in prosocial actions such as sharing, comforting, and cooperating, which are essential for positive interactions and emotional bonds to occur within the peer group (Decety & Jackson, 2004; Findlay et al., 2006; Hoffman, 2001; Qiu et al., 2024). Shame and guilt, on the other hand, are part of moral development, and foster positive social participation by guiding preschoolers to recognize and correct their mistakes (Orth et al., 2010; Pivetti et al., 2016;

Price et al., 1996; Tangney, 1998). More specifically, when a preschooler feels shame, it often leads to a negative self-evaluation about oneself, while guilt prompts them to make amends (Dempsey, 2017; Menesini & Camodeca, 2008). Although in different ways, both of these emotions serve as behaviour regulation mechanisms, as the negative experience of shame and guilt discourages children from repeating the same actions (Dempsey, 2017; Menesini & Camodeca, 2008). In our sample both groups exhibited similar levels of empathy (**chapter 5**), shame and guilt (**chapter 8**), and we may infer from these outcomes that differences in playground behaviours were unrelated to social emotions.

Emotional competence

Contrary to previous reports (Akkaya & Doğan, 2023, Calderon & Greenberg, 2012; Sidera et al., 2017; Wang et al., 2019; Wiefferink et al., 2012, Ziv et al., 2013), our DHH preschoolers also did not show lower levels of emotional competence, which were addressed by focusing on emotion recognition and emotion regulation (**chapter 5**). The ability to recognize others' emotions is considered as an important aspect for peer interactions (Lyusin & Ovsyannikova, 2016; Song, 2021). Emotions inherently serve children's communicative purposes, enabling people to show others what they like and dislike, when they need comfort or want to be alone, and their enjoyment or desire to stop a certain behaviour (Frijda, 1986). Therefore, being skilful in emotion recognition facilitates peers' interactions by allowing children to better comprehend other's needs in given situations. While recognizing others' emotions acts as a protective factor for successful peer interactions, the inability to regulate the emotional demands that arise during these interactions is known to be a risk factor (Gross & Thompson, 2007; Harrington et al., 2020). When children struggle to manage their emotions, this directly impacts their social interactions as they tend to show more negative behaviours towards their peers, engaging in more conflicts, and exhibiting less prosocial behaviours (Blair et al., 2015; Harrington et al., 2020; Supplee et al., 2009). In our sample both groups were equally capable of decoding others' emotions and regulating their own (**chapter 5**), which suggests that differences in playground behaviours were unrelated to emotional competence.

Language skills

DHH and hearing preschoolers differed in their language skills. DHH children, exhibited lower general language skills (i.e., comprehension, production and pragmatics), and lower emotional language skills, compared to their hearing peers **(chapters 5 and 8)**. Each of these language skills plays a distinct - but important - role in preschoolers' daily interactions. Language comprehension allows preschoolers to understand and interpret the words; production empowers preschoolers to communicate their thoughts, emotions, and needs effectively; and pragmatics imply the understanding and use of social rules in communication, e.g., how to appropriately initiate conversations and take turns during conversations (Bohn et al., 2023; Clifton et al., 2012; von Grünigen et al., 2012). Additionally, emotional language skills allow preschoolers to understand and use emotion and mental state language in their daily social interactions (Ketelaar et al., 2015; Veiga et al., 2023). Although many studies have found that language plays a pivotal role in children's interactions (Barker et al., 2009; Brown & Watson, 2017; Macaulay & Ford, 2006), our findings were aligned with a study conducted by Ketelaar and colleagues (2015), suggesting that language skills do not play a major role in DHH children's social functioning **(chapters 5 and 8).** It seems that although DHH children tend to have more difficulties in their oral communication, this does - fortunately – not hinder them from engaging in conversations with their peers, which was one of their preferred activities in the playground setting **(chapter 3).** Note also that general language skills were unrelated to their socioemotional skills, suggesting that DHH children are also able to overcome those difficulties and match their peers when it comes to their socioemotional development **(chapters 5 and 8).** Thus, although DHH preschoolers in our sample exhibited more difficulties in their language skills compared to their hearing peers, this aspect was still unrelated to the differences found in their playground behaviours.

Therefore, going back to the first aim of the current thesis, we do see that DHH preschoolers tend to be more solitary at the playground setting than their hearing peers. However – and contrary to our initial assumptions regarding the second aim – these non-social behaviours were unrelated to their overall competencies, as these were comparable to their hearing peers. Thus, in light of the social-ecological model, this suggests that the difference between DHH and hearing children's movements in the playground arises

from the influence that characteristics of their microsystem (extrinsic factors) impose on these children, rather than intrinsic factors.

BOX 2. Assessing preschoolers' social functioning

Methodologically, assessing social and emotional functioning in preschoolers can be challenging considering the lack of validated instruments that are reliable and appropriate for this developmental stage. Aiming to provide a comprehensive outlook on preschoolers social and emotional functioning, this thesis employed a combination of technology with traditional methods, and validated two caregiver reports specifically tailored for this age group.

Traditional methods combined with technology

In **chapter 3 and 6**, traditional methods were combined with technology to improve data collection. More specifically, in **chapter 3** naturalistic playground observations used to assess preschoolers playground behaviours were supported by a newly developed software specifically designed for these types of studies, which facilitated the coding and data transcription process (Observideo). Furthermore, in **chapter 6** peer preference data also comprised the use of a newly validated measure for preschoolers, the computerized sociometric assessment (Endedijk & Cillessen, 2015). This method has shown equal reliability as traditional techniques, while offering a more time-efficient, cost-effective, and minimal distraction of young children (Endedijk & Cillessen, 2015).

Validation studies

Whether designing new questionnaires, or adapting pre-existing ones, validation studies focused on instruments for preschoolers contribute to research by providing instruments that capture intended constructs and produce reliable results that are age and culturally appropriate. The process of developing a questionnaire consists of many steps, starting with a thorough literature review, development of items with child development experts from different backgrounds, and pilot testing with a sample of the target population. While the process of validating requires assessment of its reliability and validity in a targeted population.

To the best of our knowledge, the current thesis was the first to validate two questionnaires for such a young age group. Parent reports were used to validate an existing empathy questionnaire (original language Dutch) for Portuguese children **(chapter 4)**, and to develop and validate a questionnaire that measures three moral emotions distinctively (i.e., shame, guilt, and pride; **chapter 7**) in the preschool age. The validation of these questionnaires not only contributed to the current body of work by ensuring that the measures used were both reliable and valid, but are also an important contribution for future research that targets social emotions within a similar age group.

THE MICROSYSTEM - THE IMPACT OF THE PHYSICAL AND SOCIAL ENVIRONMENT

Physical environment

All DHH children in this thesis lived and were tested in Portugal during a period of 5 years (2017-2022). DHH children and their parents were recruited in two hospitals in Lisbon and asked to participate in this study during their hospital visit. Caregivers of the DHH children indicated the preschool that their child attended, and only when the parents gave their permission the preschool was contacted and asked to participate. All indicated preschools and caregivers of preschoolers in the same classes as the DHH child were asked to participate. All participating preschools were mainstream and the control group of the current study was composed of classmates of our DHH participants, who were all hearing children.

The majority of DHH preschoolers in our sample were CI users who were early-bilaterally implanted. In Portugal, cochlear implants are now the most commonly used device for children who have severe to profound hearing loss, allowing DHH children to have access to a wider range of auditory information compared to conventional hearing aids (Basura et al., 2009; Naik et al., 2021; Rich et al., 2013). However, even with all these new technologies DHH children in the current study were still engaging less than their hearing peers, similar to the outcomes found in studies that were conducted 25 to 45 years ago (see Antia et al., 2012, for a review). Yet, it is important to realize that interactions between children and their microsystem are bidirectional (Bronfenbrenner, 1979), and thus efforts in auditory rehabilitation become insufficient if the characteristics of the microsystem are not considered and adapted where necessary.

The physical environment of the playground - which is part of the microsystem - can make or break interactions between the child and the peer group, however its importance is often ignored in terms of research but also by stakeholders (e.g., teachers, therapists, caregivers). For example, playgrounds often have poor acoustics, which can feel overwhelming for DHH children. Indoor or covered play areas might increase echo and reverberation which can hinder DHH children from being able to join in with their peers, as they might simply not be able to hear them (NDCS, 2015). Additionally, smaller playgrounds might be too crowded with groups of hearing children generating a lot of

background noise, which might contribute to DHH children's preference for peripheral areas (Brunnberg, 2005; NDCS, 2015). Therefore, in this context DHH preschoolers may struggle to pick up auditory information, locate sounds, and follow conversations, which is not only very challenging but can justify the fewer opportunities that DHH children have to join and sustain interactions with their peers.

Social Environment

Additionally, peer actions – and reactions - may also play an important role. Many previous studies show that DHH children often experience social isolation and exclusion when they are on the playground (Deluzio & Girolametto, 2011; Guralnick et al., 2006; Levine & Antia, 1997). Although some of these behaviours may arise from the fact that some hearing children may exclude DHH children just from being different, others may exclude DHH peers unintentionally due to lack of awareness on what it takes to interact with a DHH peer in a noisy environment, such as playgrounds, and fast-changing dynamics, such as play. With most DHH children currently integrated into mainstream education, they are often surrounded by hearing children who effortlessly communicate with each other, while communicating with the DHH child takes more effort. For example, hearing preschoolers need to understand that DHH preschoolers need to see who is speaking and clearly see the face of who is speaking, so they can (additionally) lip read. Additionally, they must recognize the importance of turn-taking when having conversations with DHH peers. However, awareness of all these aspects is particularly challenging for young children, and thus need to be reinforced by other elements of the microsystem such as caregivers and teachers.

THE MESOSYSTEM – PRACTICAL SUGGESTIONS FOR THE COORDINATION OF THE ELEMENTS OF THE MICROSYSTEM

While the current thesis provides a fairly positive scenario regarding socioemotional development of DHH preschoolers, our findings also suggest that targeted interventions with the DHH children, their peers, and the context are needed to promote their social participation within the peer group. Importantly, the current findings show us the importance of the coordination between macro and microsystems. Macrosystems include the attitudes and ideologies that society has towards a specific individual and their characteristics (Bronfenbrenner, 1979). Focusing on DHH children, macrosystems are of

particular importance since they guide policies regarding healthcare, education and intervention, directly impacting DHH children's microsystems. For example, changes in ideologies now prioritize attendance of DHH children in mainstream schools. Furthermore, changes in ideologies have also contributed to access of DHH children with profound hearing loss to two CIs, rather than just one. However, most of the policies are directed towards the individual - and fixing the hearing loss - rather than also targeting the microsystem that surrounds the DHH child. Thus, based on the current findings we suggest a few changes in the microsystem and at the policy levels that could positively contribute to DHH children's social overall development.

First, and most important as this forms the basis for all other kinds of interventions or policies, the physical environment of the playground should be addressed first of all to ensure equity. Thus, (re-)structuring of the physical environment of the playground should take into consideration the experiences of DHH children in their design. Fundamental changes such as reducing visual barriers and creating a better acoustic environment, would provide these children with better access to visual and auditory information which in turn could increase their social participation. Furthermore, also in the context of preschool, teachers may take a proactive role in creating a more inclusive social environment, for example creating more awareness of hearing children on how to effectively communicate with a DHH child, through play (e.g., role play) or educational activities.

Second, exercise play is a promising tool for initiating and maintaining interactions between DHH preschoolers and their hearing peers **(chapters 2 and 3)**. Therefore, play based interventions within the peer group (e.g., psychomotor therapy) can play an important role for the social participation of DHH preschoolers. The fact that exercise play is based on movements rather than words creates a common ground for the DHH and hearing peers to communicate and interact. By 'levelling the playfield' for DHH children, exercise play helps the children within the peer group to get familiar with one another, gain more confidence for future interactions, and learn about each other's interest.

Third, DHH preschoolers in the current study exhibited lower language abilities – specifically in language comprehension, production and pragmatics - than their hearing peers **(chapters 5 and 8)**. A first suggestion to combat these differences would be to use

pretend play-based intervention in the preschool setting. Research over the years has found positive associations between engagement in pretend play and language skills (Brown et. al., 2001; Lillard, 2013). Therefore, pretend play facilitated by an adult might positively contribute to language abilities of DHH children while also helping them engage more spontaneously in pretend play in the outdoor playground. Currently, policies for follow-up intervention of DHH children including speech therapy is available in the public health system in Portugal for a mandatory duration of 6 months (Box 1 in Chapter 1). However, the guidelines for speech therapy beyond this period are not well defined, and also not equally accessible for all DHH children. Thus, it would be worthwhile that governmental policies extend the public speech therapy program so that DHH children have equal and better opportunities to ensure optimal development of their language skills, independently from their socioeconomic background.

Fourth, emotion vocabulary was less used by DHH preschoolers **(chapters 5 and 8)**. Since emotion vocabulary was revealed as an important aspect for empathy in both groups, it is important to raise awareness about the importance of creating opportunities for children to learn about emotions and mental states at home and also in school settings. For example, teachers and parents can be taught how to facilitate pretend play and add more emotion vocabulary and mental states language in their daily social interactions.

THE MACROSYSTEM – AUDITORY REHABILITATION POLICIES IN PORTUGAL

Although DHH and hearing preschoolers differed in their hearing status, our results showed that hearing factors were unrelated to emotional functioning and social skills (Chapter 5 and 8). DHH children in our study performed equally to their hearing peers, which was a more positive scenario compared to previous studies (e.g. Ketelaar et al., 2012, 2015; Kouwenberg, 2013; Tsou et al., 2021).

While reflecting on possible contributing factors for these positive differences, we noted that the majority of DHH preschoolers in our sample were CI users, which are now the most commonly used devices for children who have severe to profound hearing loss in Portugal, allowing DHH children to have access to a wider range of auditory information compared to conventional hearing aids. Furthermore, whereas all CI users in

our sample were treated early and bilaterally, a number of DHH children in previous studies received hearing intervention later and only in one ear (e.g., 33% in Netten et al., 2015, & in Ketelaar et al., 2012). Note that the majority of previously mentioned studies who focused on social functioning of DHH children derive from Dutch samples (e.g., Ketelaar et al., 2013, 2015; Netten et al., 2015; Wiefferink et al., 2012), while participants, in the current study were all diagnosed with hearing loss after the Portuguese government implemented the policies for early and bilateral intervention (Box 1).

Therefore, the positive outcomes regarding socioemotional competence of DHH children in the current sample align with research conducted during the last decade, that indicates that DHH children who benefit from early auditory restorative intervention show better outcomes in their communication and neurocognitive development (Geers & Nicholas, 2013; Naik et al., 2021; Nikolopoulos et al., 1999). Furthermore, DHH children who are treated bilaterally have better speech perception, less difficulties in locating where sounds are coming from, and rely less on visual cues to gain access to social information, compared to children with unilateral rehabilitation (see Gordon et al., 2013, for a review).

In sum, these factors collectively provide earlier and better access of DHH children to the auditory environment, facilitating incidental and social learning, especially in the family environment during the early years. This aspect may have been crucial for the positive outcomes observed in the current study regarding DHH preschoolers' emotional development.

LIMITATIONS AND FUTURE DIRECTIONS

Before concluding this thesis, several limitations that might be addressed in future studies will be discussed. First, the included studies were limited to a relatively small sample size of Portuguese DHH preschoolers (n = 32). As such, it would be important that future studies replicate the current work with a larger sample size to confirm the robustness of the findings with a more representative sample of the DHH population. Moreover, besides a large number of participants a more heterogeneous representation of DHH preschoolers is also recommended. For example, all preschoolers in the current study used spoken language as their primary mode of communication, which is not true

for all DHH preschoolers who can opt for sign or bilingual modes of communication. DHH children who do not use spoken language might have a different social experience—and engagement—than the DHH children included in this study. Therefore, future studies could also include DHH children who primarily use sign language, or sign-supported language, to understand how different communication modes influence the social participation of DHH children within the peer group. Furthermore, a bigger sample would also allow us to take into consideration individual differences regarding the family context, such as quality of interaction with caregivers and siblings, which are known to contribute to socio-emotional development.

Second, all of the participating DHH children were the only DHH child in their class, and had only hearing peers available to interact at school. Previous research has shown that DHH children in mainstream schools still prefer to engage in interactions with similar peers, which might have contributed to more solitude in the playground setting. Future studies should focus on schools where DHH children have both DHH and hearing peers available for interaction. The presence of DHH peers on the playground may enhance social engagement among DHH preschoolers in the playground setting.

Third, naturalistic observations were the only method used to obtain information regarding preschoolers' social functioning in the playground setting. While observations provide specific insights into children's activities and interactions, this method is very time-consuming, and it only allows limited fragments of the children's spontaneous playground interactions to be captured. Incorporating new methodologies, such as sensor data, could offer more insightful information into playground behaviours by capturing spontaneous behaviour, continuous and precise data collection. Future studies should combine observation data with these new technologies to better understand the social participation of preschool DHH children in playground settings.

Fourth, all the studies were cross-sectional, limiting our opportunity to draw causal relations and confirm if the current outcomes persist throughout childhood and adolescence. Therefore, the last recommendation is that future studies apply a longitudinal approach thus allowing us to understand how social functioning evolves over time.

Lastly, children's lived experiences at the playground were not included in the current thesis. That is, our concerns over the fewer social interaction that DHH preschoolers had in the playground setting, are based on our own expectations of children's development and the comparison with hearing children. However, it could very well be that the fewer interactions are a reflection of the DHH child's own desire. Thus, future studies should measure how children feel about their experiences at the playground and how connected they feel with the peer group, in order to draw more accurate conclusions.

CONCLUSION

The current thesis aimed to provide the status quo of social functioning – and interrelated factors – of Portuguese DHH preschoolers in relation to their hearing peers. The current findings showed that the level of socioemotional development of DHH preschoolers in all domains that were included in this thesis, was comparable to that of their hearing peers, and that similar relations were found in both groups regarding social and emotional functioning. Yet, DHH children still encountered challenges when trying to interact with their peers in the playground setting. These findings suggest that views that attributed problems in interaction to socioemotional difficulties of DHH children need to be challenged. Furthermore, there is a need to look beyond the child, and into the micro-meso-exo-macrosystems (Figure 1) around them when drawing conclusions regarding DHH preschoolers social functioning.

Importantly, the current thesis highlights the importance of differentiating between inclusion and equity for DHH preschoolers in mainstream settings. Inclusion refers to the practice of integrating DHH children into mainstream classrooms, ensuring they participate alongside their hearing peers. This involves providing access to the same educational activities, resources, and social opportunities. However, inclusion alone does not guarantee equity. Equity goes further by addressing the specific needs of DHH preschoolers to ensure they have the same opportunities for success as their hearing peers. This might involve specific support such as (re-)building a physical environment that is not auditory overwhelming for them, and supporting the use of sign language, and modified teaching strategies that accommodate their unique learning styles. While

inclusion focuses on presence and participation, equity emphasizes fairness and the provision of appropriate resources to overcome barriers, enabling DHH preschoolers to achieve their full potential in mainstream settings.

To date, most DHH preschoolers are 'included' in their microsystems, and yet equity is still missing, and this - rather than their intrinsic characteristics - seems to push them away from their peer group. Specifically, daily challenges of DHH preschoolers should be taken into consideration when designing playgrounds. Additionally, teachers and caregivers should be supported on their emotion communication with DHH children. Teachers and caregivers have a significant role in facilitating implicit emotional learning for DHH children, since these children will model the way that primary adult figures interact and handle their emotions. Nevertheless, while providing teachers with strategies to better communicate with DHH children, they can better raise awareness from peers on how to communicate with DHH children, through play or other child-friendly methods.

To conclude, the outcomes of this thesis challenge the initial assumptions on aspects that could hinder social functioning of DHH children. For many years, research has put DHH children's intrinsic characteristics and development in the centre of this complex problem, without considering that they could be 'blaming the victim'.

Personally, I hope that the current work also challenges others to continue to understand how we - as a society - can collectively make changes within the environment and within ourselves to promote equity of DHH preschoolers and allow them to develop in the same way their hearing peers typically do: by spontaneously interacting with the social world around them.

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