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CHAPTER 1

General Introduction

Our lives are inherently social. It is crucial to be aware of both our own and other's perceptions, intentions and motivations in order to be able to navigate through the social dimensions of life. The cognitive abilities of understanding and inferring within a social situation can be understood as social cognition. The development of such skills and the implications of individual differences through childhood and adulthood have been extensively studied. Moreover, these insights emphasize that social cognition and social functioning can be seen as intertwined, bidirectional and mutually enforcing processes (Wölfer, Cortina, & Baumert, 2012). Family size, sibling relationships, parenting behavior, popularity among peers and number as well as quality of friendships are all associated with children's level of various social-cognitive abilities (O'Reilly & Peterson, 2014; Shahaiean, 2015; Slaughter & Perez-Zapata, 2014; Vinden, 2001; Mayer & Träuble, 2012). The intrinsic interconnection between social cognition and social relationships or behavior invokes new questions. An important direction concerns the manner in which daily social-cognitive skills are affected by several components from the immediate situation as well as wider context in which these skills are applied. Knowledge of this contextual embeddedness of social cognition adds at a fundamental level to a nuanced understanding of how social cognition operates within its constant interplay with the social context. Furthermore, such insights have an applied value as well. The implications of individual differences in social-cognitive skills for the navigation through daily life become clearer when such differences are studied taking into account aspects of this daily life context.

An interdisciplinary approach can be highly suited to extend fundamental insights. An educational neuropsychology perspective combines neuropsychological interests on fundamental behavioral principles with elements from educational sciences on the relevance or applications of these principles for the educational context. This approach can therefore be especially appropriate to understand social cognition within the diversity and complexity of the everyday context.

The main focus of this thesis is the contextual embeddedness of children's and young adults' social cognition, from an educational neuropsychology perspective. This first chapter will continue with a brief background on social cognition, social cognition in context, and the educational neuropsychology perspective. After that, the objectives of the thesis are described in more detail and a short overview of the chapters is provided.

BACKGROUND

Social Cognition

Social cognition refers to cognitive processes involved in social interactions. This includes knowledge about the self, interpersonal motivations, perceptions of others, abilities to take other's perspectives and to infer intentions and emotions

(De Rosnay & Hughes, 2006). Such processes are crucial to navigate successfully through any social environment (Heyes & Frith, 2014). Within a complex dynamic, personal and interpersonal needs of oneself and any others involved need to be adequately inferred and understood and carefully balanced. Associations between specific social-cognitive abilities and many aspects of daily social life confirm this necessity and value of social cognition. Examples of such capable social skills are being able to stand up for oneself, joining a new group (Peterson, Slaughter, Moore, & Wellman, 2015), or competently engaging in conversations (De Rosnay, Fink, Begeer, Slaughter, & Peterson, 2014). Further, maintaining social relationships such as friendships (Wright & Mahfoud, 2012) being liked or trusted (Caputi, Lecce, Banerjee, & Pagnin, 2012; Diesendruck & Ben-Eliyahu, 2006; Slaughter, Dennis, & Pritchard, 2002; Slaughter, Imuta, Peterson, & Henry, 2015; Van Doesum, Van Lange, & Van Lange, 2013) and being less often socially rejected (Banerjee, Watling, & Caputi, 2011) are all linked to adequate social-cognitive functioning. These associations can be understood from a bidirectional notion in which social cognition and social behavior or relationships mutually reinforce each other (Wölfer et al., 2012). Longitudinal research, showing reciprocal influences between for instance children's peer relationships and their comprehension of unintentional social blunders, confirms this (Banerjee et al., 2011). Daily social interactions provide opportunities to apply, practice and continue to develop the social-cognitive skills that simultaneously aid competent navigation through these interactions (Wölfer et al., 2012).

Research on social cognition usually concentrates on one specific skill, for instance taking someone else's perspective, or inferring other's emotions. Mental state reading, the central object of the research of this thesis, is one such specific social-cognitive skill. It refers to "the ability to decode mental states on the basis of immediately available information such as facial expression or tone of voice" (Bora, Eryavuz, Kayahan, Sungu, & Veznedaroglu, 2006, p. 96) and is part of the broader Theory of Mind, the general ability to conceptualize other's mental states (Wellman & Liu, 2004). Mental state reading includes the recognition of simple (for instance, friendly) and more complex (for instance, suspicious or serious) states. Moreover, detecting these various states involves a cognitive component in the form of the possession of a mental state lexicon (Fernández-Abascal, Cabello, Fernández-Berrocal, & Baron-Cohen, 2013) together with a more intuitive component of correctly identifying these states from facial expressions in immediate social situations. It is important to note that mental state reading includes but is not limited to basic emotion recognition. Mental state reading involves the identification of complex states such as being suspicious or serious, which indicates its extension of basic emotion recognition (commonly focused on simple states, e.g. feeling happy, sad, or scared) (Diesendruck & Ben-Eliyahu, 2006; Jack, Garrod, Yu, Caldare, & Schyns, 2012). Underlying cognitive knowledge of the meaning of these more complex states is required as well (Fernández-

Abascal et al., 2013). Mental state reading can therefore be considered an advanced skill, which is present in young children from the age of eight yet continues to develop through childhood and adolescence (Baron-Cohen, Wheelwright, Spong, Scahill, & Lawson, 2001b; Girli, 2014; Gunther Moore et al., 2012).

Insights on mental state reading are diverse. For instance, groups of people who perform better at mental state reading also have a higher collective intelligence (Engel, Woolley, Jing, Chabris, & Walone, 2014). In addition, mental state reading has been shown to be higher in individuals who read fiction compared to those who do not, suggesting subtle effects of forming representations of mental states of fictive characters (Kidd & Castano, 2013) (though a later study failed to replicate this effect, suggesting reading fiction only has long term effects or motivation might have a role, Samur, Tops, & Koole, 2018). The application of mental state reading skills in complex social situations can be seen in adolescents who use these skills in scenario's of cooperation (Derks, van Scheppingen, Lee, & Krabbendam, 2015). Emotion recognition or understanding, closely linked to mental state understanding, is associated with children's prosocial behavior (Diesendruck & Ben-Eliyahu, 2006) and conversational skills (De Rosnay et al., 2014). Together, these insights affirm that mental state reading is an intricate and widely applicable social tool, valuable for various social interactions. Its clear demarcation as one specific aspect of Theory of Mind, continuing development through adolescence and persistent individual differences through adulthood make this social-cognitive skill especially suited to study within its interplay with the context in which it is applied.

Social Cognition in Context

The interactions in which mental state reading skills, and social-cognitive skills in general, are applied are always embedded in a context. Interactions take place in an immediate situation, or a setting with a specific space and time (Ashmore, Deaux, & McLaughlin-Volpe, 2004), for instance a classroom where during the lunch break a teacher talks to a child. Further, this situation is surrounded by a multilayered set of general, continuing contexts (Ashmore et al., 2004). These wider contexts can concern material realities, social structures and roles, interpersonal patterns, and belief, cultural, and societal systems (Ashmore et al., 2004, Feldman Barret, Mesquita, & Gendron, 2011). At the material level, the classroom in which the interaction takes place has certain visual characteristics, as have the individuals within the interaction themselves, for instance in the form of their body postures (Ashmore et al., 2004, Feldman Barret et al., 2011). Further, the teacher and child have a role and position, with which rules and habits are associated, as well as possibly a more personal relationship (Ashmore et al., 2004). The components from these contexts are embedded in society and culture.

Social cognition can interact with components of these contextual layers in various ways. One example, concerning the material reality in which an interaction is embedded, is that emotion recognition is influenced by the body postures of individuals present as well as by the surrounding social situation (Feldman Barret et al., 2011). Restricted to the area of the face someone might appear to look in fear or in despair when the bodily and surrounding context show that this person is ecstatic for winning a game (Feldman Barret et al., 2011). A different contextual effect comes from individuals' cognitive frameworks, which concerns context at a more abstract or underlying level. Cognitive frameworks or mindsets (embedded in individuals' societal and cultural backgrounds) are associated with specific social-cognitive habits or styles which influence how these individuals perceive a social situation, thereby shaping the context of this situation as well. How a context is shaped by the association between such individual characteristics and social-cognitive styles has been most extensively studied for culture. Cultural mindsets refer to sets of meanings that include knowledge of the self, cognitive procedures and interpersonal goals (Oyserman, 2011). Such mindsets differ in core themes, for example prioritizing the individual or the group, which results in an emphasis on either personal autonomy or interpersonal connectedness that can be observed in social-cognitive processes as well. In cultures that emphasize personal autonomy it is quite common to express negative emotions. When interpersonal connectedness is a core value however, these emotions might be suppressed to maintain group harmony. Cultural diversity in emotional and mental state expressions, associated with differences between cultural mindsets in interpersonal values and goals, can be seen in frequency of occurrence of specific emotions, the intensity with which specific emotions are expressed, and particular expression styles (De Leersnyder, 2017; Elfenbein & Ambady, 2003; Jack et al., 2012).

Social Cognition in Context: Familiarity

The association described above between emotional or mental state expression style and cultural mindsets can become salient within interactions because of the ingroup-advantage or familiarity effect (Adams et al., 2010; Elfenbein & Ambady, 2003). This entails that the recognition of simple emotions as well as complex mental states is enhanced when individuals encounter emotional expressions they are more familiar with (Adams et al., 2010; Elfenbein & Ambady, 2003). The mechanism of familiarity (Elfenbein & Ambady, 2003) has been observed not just for culture but for different contextual components. Emotion or mental state recognition performance is higher for more frequently occurring emotions (Calvo, Gutiérrez-García, Fernández-Martín, & Nummenmaa, 2014), in friends or partners compared to strangers (Sternglanz & DePaulo, 2004) and, finally, in individuals with a similar (compared to a different) cultural background (Adams et al., 2010, Bjornsdottir & Rule, 2016, Elfenbein & Ambady, 2003). Generally speaking,

familiarity entails that social cognition is enhanced when individuals are more familiar with, closer to, have been more frequently exposed to, a specific component of any layer of a context in which an interaction takes place.

There are several directions to further understand this familiarity mechanism, and thereby the processes of contextual embeddedness. First, the range of contextual components for which this mechanism has been confirmed is wide. This suggests that various background characteristics of individuals present within an interaction can shape the context of this interaction, through the familiarity effect. Correspondence between individuals' emotional expression styles will directly benefit their social navigation (De Leersnyder, Mesquita, & Kim, 2011). This of course applies to any set of interaction partners who might differ in their social-cognitive style. One evident direction therefore is to explore the contextual mechanism of familiarity in interactions between adults and children. Although adults and children engage in interactions on a daily basis, it is likely that their emotional or mental state expression styles differ. Adults adopt specific roles in their relationship and interactions with children. They are for example parents, raising the child, or teachers, facilitating classroom functioning (Epstein, 1998; Bjerke, 2011). Further, adults are more experienced in emotion or mental state expression and recognition, specifically concerning sophisticated emotional displays (Del Giudice & Colle, 2007). The possibly resulting different expression styles between children and adults can be an intriguing area to study within interactions between children themselves and between children and adults.

A second further direction in which the contextual mechanism of familiarity can be examined concerns the dynamic nature of the contextual embeddedness of social cognition as well as the interplay between components from different situational and contextual layers. The context surrounding daily social situations is highly complex (Parigi, Santana, & Cook, 2017). One aspect of this complexity is that the embeddedness of social cognition within such contexts is not static (Oyserman, 2011). Mindsets which contribute to specific social-cognitive styles can shift, depending on immediate contextual cues as well as on (frequency of) recent activations (Oyserman, 2017). Individuals who have been longer exposed to a specific culture other than their original culture become better at reading mental states in individuals with this specific cultural background, thereby showing a decrease in the cultural in-group effect (Bjornsdottir & Rule, 2016; Elfenbein & Ambady, 2003). Furthermore, this indicates that components from different situational and contextual layers are interwoven. Individuals might be inclined towards a specific mindset associated with their own cultural background but have a different mindset at the foreground because of frequent daily or immediate exposure to that mindset. Such interactions between contextual effects are intriguing in themselves but also especially relevant for individuals with a bicultural background. Bicultural individuals are likely to frequently engage in

interactions with individuals with a different cultural background and consequently are often exposed to different social-cognitive styles.

Social Cognition in Context: Network Perspective

The mechanism of familiarity and consequently the two further directions described above on contextual embeddedness concern direct interactions between individuals. Surrounding the interactions between these individuals are their social relationships. Especially for children the presence and quality of social relationships in the form of friendships or peer relations is well established as beneficial for and at the same time benefiting from their social-cognitive skills (Caputi et al., Pagnin, 2012; Diesendruck & Ben-Eliyahu, 2006; Slaughter et al., 2002; Slaughter et al., 2015; Wright & Mahfoud, 2012). Further, the mechanisms through which this context is associated with social cognition appear relatively straightforward. At the core of understanding the value of social cognition lays its application in social interactions which are at the foundation of social relationships. Evidently the interactions in such relationships provide opportunities to further practice and develop social-cognitive skills while simultaneously these relationships benefit from successful interactions due to competent social cognition (Wölfer et al., 2012).

However, individuals' social relationships tend to be part of an interconnected larger group (Borgatti & Ofem, 2010; Vermande, van den Oord, Goudena, & Rispens, 2000; Wölfer et al., 2012). Friendships between children at school exist within a school class containing multiple, either separate or interconnected, groups of friends. Children can be highly connected here, being directly as well as indirectly (through other children) connected with many children, but they can also be part of a small dyadic group, separated from the rest of the class. These different positions children have within the network of their class are relevant for their social-cognitive skills. A child who is more central in a network is required to carefully manage this interconnected group, taking into account thoughts and feelings of directly as well as indirectly connected peers or friends. This asks for sophisticated social-cognitive skills, which can be applied and therefore practiced here as well. Such a network perspective is therefore a promising approach to understand more precisely how the context of social relationships requires and facilitates social-cognitive skills.

An Educational Neuropsychology Perspective

Importantly, despite the recent increase in attention for especially the cultural context, contextual embeddedness is not necessarily the primary focus of or included in studies on specific social-cognitive skills, among which mental state reading. Mental state reading is commonly measured with the Reading the Mind in the Eyes task, in which correct mental states need to be inferred from pictures of eyes accompanied by four mental state terms (Baron-Cohen, Wheelwright, Hill,

Raste, & Plumb, 2001). This paradigm itself as well as the interest of many studies in which it is used is mostly neuropsychological, aiming to fundamentally understand individual differences in this process at the behavioral or neural level (e.g. Castelli et al., 2010; Gunther Moore et al., 2012; Overgaauw, Van Duijvenvoorde, Gunther Moor, & Crone, 2014). These studies have yielded valuable insights, for instance showing individual differences (during adolescent development, Overgaauw et al., 2014, or associated with later aging, Castelli et al., 2010) at the neural level without the presence of behavioral differences. Yet, important questions remain and arise on the interaction between this skill and individual differences within these skills, and the everyday social situations in which it is applied.

Educational neuropsychology and educational neuroscience are both interdisciplinary perspectives that involve, most fundamentally, the connection between neuroscience or neuropsychology and educational sciences or practice. Interests within these interdisciplinary perspectives can concern cognitive educational functions or processes (such as mathematical reasoning, Butterworth, Varma, & Laurillard, 2011; Gabrieli, 2009), but also processes, including social-cognitive, that concern interactions within the educational context (Fischer, Goswami, & Geake, 2010). Educational neuroscience and educational neuropsychology differ in the level at which such processes are studied (neural or behavioral). However, both involve the interplay between more fundamental scientific interests (aimed at discovering principles) that are inherent in neuroscience and neuropsychology and the more applied element of educational sciences that always implies, though to different extents, the (explicit) consideration of an environment (De Smedt & Grabner, 2015; Willingham, 2009). An interdisciplinary approach that combines these interests therefore is especially suited to study the contextual embeddedness of social cognition. Within educational questions and approaches themselves the manner in which and extent to which the environment is considered can vary. For instance, educational studies can focus on the implementation of a specific intervention but can also concern the development of an educational process. An interdisciplinary perspective that involves educational sciences can take different forms as well. Within this research the interdisciplinary element primarily implicates the explicit consideration, within both the research question and approach, of the everyday context in which social-cognitive skills are applied.

THESIS OUTLINE

Aims

This thesis examines social-cognitive skills of children and young adults, taking into account the context in which these skills are applied. The first aim is to gain insight in the contextual embeddedness of social cognition, primarily mental state

reading, and consequently to understand individual differences by taking this contextual embeddedness into account. The second aim is to explore the application of an educational neuropsychology perspective in the study of social cognition. The disciplines of neuropsychology and educational sciences are connected here fundamentally because the interest lies in understanding mental state reading studied with a traditional neuropsychological paradigm, yet taking into account explicitly the everyday school or societal context of children or young adults in which this is construct is applied.

In order to achieve these aims, this thesis starts with a theoretical exploration of an interdisciplinary perspective connecting neuroscience and educational sciences (Chapter 2). This exploration is an aim itself, investigating what forms such a perspective can take and the insights these forms can yield. In addition, this evaluation underlies the empirical chapters that strive to apply the interdisciplinary approach. These empirical chapters each focus on a different contextual component or contextual layer in which children's or young adults' social cognition is embedded. First, effects of familiarity with mental state reading styles within interactions between children and adults are investigated (Chapter 3). This contributes to insights in the contextual mechanism of familiarity in association with differences in mental state reading related to development or children's and adults' roles. Second, this mechanism of familiarity is also investigated in its association with cultural background and acculturation measures in young adults with a bicultural background (Chapter 4). This also gains insights in the interplay between different layers of context, since these acculturation measures can be seen as indications of daily exposure to and familiarity with mindsets associated with different cultures. Third, children's social cognition as embedded in the social network of their class is investigated from a network perspective (Chapter 5). This explores the interplay between social-cognitive skills and the context of an interconnected web of social relationships.

Approach

One theoretical paper and three empirical papers are included in this thesis. Chapter 3 concerns data from two waves of a large scale longitudinal project on children's psychosocial development ("Happy Children, Happy Adolescents?"). The data used for this thesis were collected in 4th and 5th grades of elementary school (collected during wave 3 and wave 4). In addition, two smaller data collections in the 4th grade of elementary school through the 2nd grade of high school were conducted for this chapter. Chapter 4 is based on data from the longitudinal Transitions in Amsterdam (TransAM) project, which involves young adults with Dutch, Antillean-Dutch and Moroccan-Dutch backgrounds. Data from wave 1 and wave 4 are used. Finally, Chapter 5 is based on data from the same project as Chapter 3, focusing on the 4th grade of elementary school (wave 3 of this project).

Chapter overview

Chapter 2 concerns a theoretical reflection on the discipline of educational neuroscience, examining the connection between neuroscience and educational sciences within this discipline. It considers different positions educational neuroscience can take in its relation to the involved fields of neuroscience, educational sciences and educational practice. This elucidates the aim of this interdisciplinary perspective as well as its possibilities to transfer insights to educational practice. This chapter thereby also serves as a theoretical background on the educational neuropsychology approach of the three empirical chapters that include such a connection between disciplines.

Chapter 3 examines children's mental state reading in context by focusing on the contextual component of the individuals within the interaction being children or adults. Through three substudies, children's (between 7 and 14 years old) mental state reading of other children and of adults was assessed. This had both the aim to gain insight in this developmental contextual component, and to consequently assess whether the Reading the Mind in the Eyes task is suited to study mental state reading in children. The Reading the Mind in the Eyes task assesses mental state reading also in its child form with pictures of eyes of adults. A difference between children's mental state reading of children's and adults' eyes would question whether this task adequately captures children's daily mental state reading.

Chapter 4 examines mental state reading of young adults. In this chapter, the contextual component of the cultural background of the individuals within an interaction is explored. Young adults (between 19 and 24 years old) with an Antillean-Dutch, a Moroccan-Dutch and a Dutch background completed mental state reading tasks reading mental states of Western and Antillean or Moroccan individuals. In addition to gaining insight in the contextual embeddedness of mental state reading concerning this cultural background component, in the bicultural groups individual differences within cross-cultural mental state reading were related to psychological and behavioral acculturation measures. Such measures can be seen as indications of daily familiarity with the involved cultures thereby investigating the interplay between different contextual layers.

Chapter 5 investigates mental state reading as well as the social-cognitive skill of social mindfulness in young children, in relation to their position within the peer and friendship social network of their class. Here, social cognition is applied in the context of social relationships at school, approaching these social relationships from a network perspective that takes into account the complexity of these relationships as part of an interconnected group.

Chapter 6 presents concluding remarks of this thesis. It discusses the findings and theory of the chapters in light of the thesis aims, and also provides recommendations for future research.

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