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CHAPTER 6

Concluding Remarks

The research described in this thesis focused on children's and young adults' social-cognitive skills embedded in the context in which these skills are applied. This topic was approached from an educational neuropsychology perspective. Consequently, the aims were to both understand individual differences in mental state reading embedded in context and to explore the application of an educational neuropsychology perspective in the study of this topic. Individual differences in and development of social cognition have been widely studied, and its significance within the social interactions that constitute a large proportion of our lives has been established (Caputi, Lecce, Banerjee, & Pagnin, 2012; De Rosnay, Fink, Begeer, Slaughter, & Peterson, 2013; Diesendruck & Ben-Eliyahu, 2006; Slaughter, Imuta, Peterson, & Henry, 2015; Van Doesum, Van Lange, & Van Lange, 2013). Yet, a further endeavor and challenge is to understand and take into account the diversity and complexity of the multilayered set of the immediate situation and context in which these interactions take place (Ashmore, Deaux, & McLaughlin-Volpe, 2004). An educational neuropsychology perspective combines the more fundamental interest of neuropsychology in social-cognitive processes with educational sciences' essential element of considering a particular environment.

Starting with a summary of the findings of the four papers of this thesis, the theoretical exploration of an interdisciplinary connection between educational sciences and neuroscience in Chapter 2 showed that such a connection can take different forms. These forms or positions vary in the extent to which the involved disciplines are more at the foreground and consequently in the research questions, aims and approach taken. It appears inevitable to take a certain position in such an interdisciplinary perspective. This points towards the importance of evaluating which position is taken in the current empirical chapters where an educational neuropsychology perspective is applied. Such an evaluation is included at the end of this conclusion. The empirical chapters all used this perspective to study a different contextual component or layer in which children's or young adults' social cognition is embedded. Chapter 3 investigated mental state reading within the context of interactions between children and adults, showing that children were better at reading mental states of other children compared to reading mental states of adults. Chapter 4 focused similarly on mental state reading embedded in interactions of young adults with different cultural backgrounds (Dutch, Antillean-Dutch and Moroccan-Dutch). Here, it was shown that young adults with a Dutch background were better at reading mental states in Western faces compared to either Antillean or Moroccan faces. Further, the young adults with a bicultural Antillean-Dutch or Moroccan-Dutch background did not show any advantage in reading eyes from either culture, but were equally skilled at reading Western and Antillean or Moroccan faces. Self-reported acculturation measures, which can be seen as indicators of daily exposure to cultures and therefore aimed to provide insights in the interplay between different contextual layers, were also

not clearly associated with individual differences in Western and Antillean or Moroccan mental state reading. Finally, Chapter 5 used a network perspective in its investigation of children's social-cognitive skills (mental state reading as well as social mindfulness) in relation to the context of an interconnected web of their friendship as well as peer relationships at school. Only a positive trend between children's mental state reading and the position in their friendship network was found. Mental state reading appeared not related to position in the peer network and social mindfulness skills were related to neither friendship nor peer network position.

In this final chapter these insights from the four previous chapters are integrated and discussed in light of the aims of this thesis. Further, the approach and methodology of the studies is reflected on and finally, recommendations for future directions are described.

Mental State Reading In Social Interactions

Interactions in which social cognition is applied take place in the context of a specific situation (Ashmore et al., 2004). This situation is in turn surrounded by a multilayered set of continuing contexts such as material realities, social structures and roles, interpersonal patterns, and belief, cultural, and societal systems (Ashmore et al., 2004, Feldman Barret, Mesquita, & Gendron, 2011). Social cognition can be affected in various ways by components of these different contextual layers. Both Chapter 3 and Chapter 4 focused on specific characteristics of the individuals present in an interaction that can shape the context of this interaction. The familiarity of individuals within an interaction with social-cognitive styles associated with these characteristics is a fundamental mechanism through which this contextual impact can take place (Elfenbein & Ambady, 2003). When individuals are more familiar with a contextual component, for instance in the form of a background characteristic of the individuals present, their social cognition is enhanced. The familiarity effect has been most clearly established in the area of individuals' cultural mindsets, which are associated with specific emotional or mental state reading expression styles (Adams et al., 2010; Elfenbein & Ambady, 2003). Also known as the (cultural) in-group advantage, this effect entails that individuals are better at recognizing simple emotions and complex mental states when they encounter emotional expressions styles they are familiar with, such as of individuals with a similar cultural background (Adams et al., 2010; Elfenbein & Ambady, 2003).

This mechanism was explored in Chapter 3 in the context of mental state reading in children's and adults' interactions, by assessing children's performance in reading mental states of children and of adults. Further, the presence of familiarity was examined in mental state reading of young adults with a Dutch, Antillean-Dutch and Moroccan-Dutch background in Chapter 4. Mental state reading of Western eyes was compared to mental state reading of Antillean or

Moroccan eyes in these young adults. These chapters showed a higher performance in children's mental state reading of children compared to adults and a higher performance in young adolescents with a Dutch background in reading Western mental states compared to either Antillean or Moroccan mental states. Further, the findings of Chapter 4 did not confirm a similar advantage in the young adults with a bicultural Antillean-Dutch or Moroccan-Dutch background, who performed equally well in reading Western and Antillean or Moroccan eyes. An exploration of the association between cross-cultural mental state reading in these individuals with a bicultural background and their self-reported acculturation also revealed no clear patterns between these different contextual layers.

A first implication of the findings of both of these chapters concerns the suggestion of the generalizability of the familiarity effect. This effect has been previously established within different cultural comparisons (Adams et al., 2010; Bjornsdottir & Rule, 2016; Elfenbein & Ambady, 2003), but not for specifically the Dutch vs. the Antillean or Moroccan culture. Its presence in the comparisons between these groups indicates that reading mental states in Western faces is different from reading mental states in Antillean and Moroccan faces. This suggests a difference in emotional or mental expression style between these cultures, which affects interactions where individuals with both these cultural backgrounds are present. Further, children's advantage in reading children's compared to adults' eyes within the child-adult contrast is especially intriguing. It substantiates, continuing on previous findings on friends vs. strangers (Sternglanz & DePaulo, 2004) and frequently vs. less frequently occurring emotions (Calvo Gutiérrez-García, Fernández-Martín, & Nummenmaa, 2014), that the 'in-group advantage' is a general contextual mechanism. Social-cognitive skills appear to be enhanced within an interaction due to familiarity with various contextual components. This also increases the likelihood that what is at work here is in fact primarily the advantage of being familiar, instead of other processes. One example of such an alternative process that has been suggested to explain specifically the cultural in-group advantage is a higher motivation to process in-group faces (Young & Hugenberg, 2010). Motivation might have a complementary role, while individuals first and foremost are enabled in their mental state reading when they process familiar information.

It is critical to be aware here that for the current findings as well as most previous findings on familiarity (Adams et al., 2010; Bjornsdottir & Rule, 2016; Elfenbein & Ambady, 2003) the advantage in mental state or emotion reading of the own culture or developmental stage is directly substantiated. This advantage is thought to be grounded in stylistic differences in emotional or mental state expression styles related to culture or developmental state. The latter, however, is an assumption. The advantage children have in reading other children's eyes is presumed to be based on a difference in style between mental state expressions of

children and adults. There are indications for this stylistic difference, both empirical (in the form of adults' higher experience with sophisticated emotional expressions, Del Giudice & Colle, 2007) and theoretical (in the consequences of the differences between child-child and adult-child relationships, Epstein, 1998, Bjerke, 2011). Actual child and adult expression "styles" need yet to be identified though, as well as their link to subsequent developmental states. As for the cultural context component, assumed underlying differences between cultures are not uncommon in cross-cultural research, including concerning the in-group advantage (Elfenbein & Ambady, 2003; Adams et al., 2010). These insights on the in-group advantage include for instance higher performance of individuals with an Asian background in reading Asian compared to Western faces, and the higher performance of individuals with a Western background in reading Western compared to Asian faces (Adams et al., 2010; Elfenbein & Ambady, 2003). The association with underlying cultural differences between these groups in interpersonal goals or values however was not investigated in these studies. The cultures compared in Chapter 4 have been typified elsewhere as different in their overall emphasis on group oriented (Antillean and Moroccan culture) or individual autonomy oriented values (Dutch culture) (Merz, Özeke-Kocabas, Oort, & Schuengel, 2009; Phalet & Schönflug, 2011; Schalk-Soekar, Van de Vijver, & Hoogsteder, 2004; Stupar, Van de Vijver, Te Lindert, & Fontaine 2014; Van de Vijver, 2007). These contrasting value orientations are likely to contribute to distinct emotional expression styles (De Leersnyder, 2017; Elfenbein & Ambady, 2003; Jack, Garrod, Yu, Caldare & Schyns, 2012). Direct associations between the values of the Dutch, Moroccan and Antillean culture and emotional expression styles however remains to be established.

A second notable finding is the lack of an in-group advantage in the mental state reading of the young adults with a bicultural Antillean-Dutch or Moroccan-Dutch background in Chapter 4. Previous studies have identified that within bicultural groups the in-group advantage can be entirely absent indeed (De Leersnyder, 2017) or present with individual fluctuations (Bjornsdottir & Rule, 2016). This points towards the dynamic nature of contextual embeddedness of social-cognitive skills (Bjornsdottir & Rule, 2016; Elfenbein & Ambady, 2003; Oyserman, 2017). Further, it confirms the relatively high orientation towards both cultures in these specific groups (Novin & Rieffe, 2011; Novin, Banerjee, & Rieffe, 2012; Stevens, Pels, Vollebergh, & Crijnen, 2004). Somewhat surprising was the lack of clear associations between individual variability within the presence of an in-group advantage and self-reported behavioral and psychological acculturation. Such indications of daily general presence of contextual cues have been related in different bicultural groups to (contextual embedded) cross-cultural mental state reading (Bjornsdottir & Rule, 2016; Elfenbein & Ambady, 2003). These previous findings might be explained by understanding context as a multilayered set consisting of an immediate situation and wider surrounding contexts (Ashmore et

al., 2004; Feldman Barret et al., 2011). In Chapter 4 such an effect was only found in a lower performance of Western mental reading of young adolescents with an Antillean-Dutch background who used the Antillean language (Papiamentu) more often. This can be seen as an indirect effect of daily exposure to the Antillean culture (through language use) on familiarity with the Western emotional expression style. More consistent and clear effects were expected, also for the other included acculturation measures of cultural identification and having friends with different cultural backgrounds. However, this one finding hints at the possibilities to investigate the interplay of different contextual layers. This can include acculturation patterns, which is a valuable area in understanding bicultural groups.

A third finding, concerning the familiarity effect in Chapter 4, was that young adults with a Dutch background were not only more skilled at reading eyes in Western compared to Antillean or Moroccan faces, but also in mental state reading in general (compared to young adults with an Antillean-Dutch and Moroccan-Dutch background). This points towards the possibility that other cultural characteristics are at work in addition to specific emotional expression styles. A tendency within a culture to focus on the face or the surrounding situation in social interactions (Masuda et al., 2008) or differences within the extent to which individual's mental states are focused on (Naito & Koyama, 2006) can both affect overall mental state reading ability. Interestingly such effects remain in line with the idea of familiarity, yet concern being familiar with a general social-cognitive process (reading mental states in the face) instead of a specific style within such a process (reading mental states in the face expressed in a particular manner). It would be intriguing to see how these different effects work through the development of social-cognitive skills.

Finally, different cultural characteristics can also become present in developmental pathways. Social-cognitive skills such as false belief understanding are universally mastered at a certain point while the age at which this occurs differs between cultures (Slaughter & Perez-Zapata, 2014) as well as the exact steps in which specific tasks related to this Theory of Mind skill are mastered (Shahaeian, Peterson, Slaughter, & Wellman, 2011). This might in turn work together with cultural differences in parent-child roles and relationships (Epstein, 1998; Bjerke, 2011). Perhaps the advantage for children to read children's eyes found in Chapter 3 is culturally-developmentally specific.

Children's Social Cognition at School

Chapter 3 and Chapter 5 focused on children's social cognition in context. These insights can be highly valuable to understand children's navigation through social life, which includes school. At school children apply their social skills and develop meaningful relationships with other children. This is part of their social development but also affects their adaptation and academic achievement

(Banerjee, Watling, & Caputi, 2011; Hay, Payne, & Chadwick, 2004; Porath, 2003, Valiente et al., 2011). The main insights of these two chapters are, first, the finding described above that children are better in reading mental states of other children than of adults (Chapter 3). Chapter 3 also showed that children gradually improve both in their reading of children's and of adults mental states. Second, in Chapter 5 a social network perspective was applied to gain insight in children's social cognition in the context of their social relationships at school. Children's positions in their friendship and peer relationship (reflecting how central they were based on their direct as well as indirect connections) were related to their social-cognitive functioning in the form of mental state reading as well as social mindfulness. Social mindfulness, a recently developed construct, refers to taking and honoring another's perspective within a social interaction (Van Doesum et al., 2013). This becomes apparent in the subtle prosocial behavior of choosing in such a way that another individual is left with a choice as well. Since individuals who act socially mindful tend to be liked and trusted (Van Doesum et al., 2013), it could be expected that children who are more socially mindful are also more central in the social networks of their class. However, the findings of Chapter 5 showed that mental state reading was not related to children's position in their peer and friendship network, although for the friendship network a positive trend was visible. Social mindfulness was not related to either friendship or peer network centrality.

It is interesting to consider the absence of these relationships in light of previously found nuances to the overall quite strongly confirmed positive association between social cognition and social life (Caputi et al., 2012; Diesendruck & Ben-Eliyahu, 2006; Heyes & Frith, 2014; Van Doesum, Van Lange, & Van Lange, 2013; Slaughter, Dennis, & Pritchard, 2002; Slaughter et al., 2015). Factors such as gender can have a role, with level of Theory of Mind being related to prosocial behavior in girls but to aggressive behavior in boys (Walker, 2005) and the association between peer popularity and empathy being positive for girls while negative for boys (Oberle, Schonert-Reichl, & Thomson, 2010). More importantly, Theory of Mind has been associated both with low and high peer acceptance, mediated through prosocial behavior (Caputi et al., 2012). This points towards different uses of the perhaps in itself neutral ability to take someone else's perspective, as has been confirmed in children's "nice" and "nasty" use of Theory of Mind (Lonigro, Laghi, Baiocco, & Baumgartner, 2014). This is especially relevant for the findings of Chapter 5 since a network perspective might open up more such nuanced mechanisms and effects. There are different ways to approach a child's position in the social network of his or her class. The current focus was on children's direct and indirect (through other children) connections with friends and peers. A child with high centrality then is structurally more important and needs to manage a complex whole of interconnected children. Social cognition skills are relevant (in their application and practice) because the more central

children are, the more they need to infer and take into account thoughts and feelings of friends and friends of these friends. Alternatively however, favorability of a network position can for instance be understood by looking at whether an individual's position is between others, which makes him or her in charge of the flow within a network (Borgatti, Everett, & Johnson, 2013, Hanneman & Riddle, 2005). This implies different, perhaps negotiation-related, social cognition skills. Moreover, such different positions might also imply different possible uses of these skills. It remains all the more surprising then that social mindfulness was not related at all to network position. Social mindfulness has been proposed as a skill that does include the aspect of "being motivated to apply it" (Van Doesum et al., 2013). Although such a skill could have the potential to be directly valuable for social relationships, it can be that either this specific type of prosocial behavior or its measurement is too subtle for this age group.

Further, evidently children's social lives are not limited to interactions with other children. Adults have an important role, including specifically at school. Teacher-student relationships affect both children's engagement and achievement from a young age (Roorda, Koomen, Spilt, & Oort, 2011). The findings from Chapter 3 indicate that it can be important to be aware of a "stylistic difference" in emotional expressions between children and adults. This can affect communication and understanding. However, two points should be taken into account. First, although children's advantage in reading children's over adults' eyes was shown, this does not imply that they are necessarily significantly bad at reading adults' mental states. Age might be an important factor here. Chapter 3 showed that both children's ability to read children's and their ability to read adults' eyes improved through the age of six to fourteen (the latter in line with previous findings, Baron-Cohen, Wheelwright, Spong, Scahill, & Lawson, 2001b). Older children in fact performed equally well at reading adults' mental states as the younger children at reading children's mental states. Apparently as children get older, despite their continuing advantage to read children's eyes, they become more capable to read adults' eyes (though they remain below average compared to adults, Hallerbäck, Lugnegård, Hjärthag, & Gillberg, 2009; Fernández- Abascal, Cabello, Fernández-Berrocal, & Baron-Cohen, 2013; Prevost et al., 2014; Prevost et al., 2014; Yildirim et al., 2011). Children can therefore be seen as being capable of reading both children's mental states and adults' mental states, yet being better in reading the mental states of other children. Second, child-adult interactions do not only involve children's reading adults' eyes, but also adults reading children's eyes. Adults' mental state reading within various contexts was not assessed in Chapter 3. However, the dynamic nature of the contextual embeddedness of social cognition (Oyserman, 2017) as well as the development towards more sophisticated and more complex expressions in adults (Del Giudice & Colle, 2007) suggests that adults are capable readers of both child and adult expression styles. Individual variability can be expected to be associated here with their recent and

frequent exposures to children's emotional expression style (Oyserman, 2017). Future studies can further investigate the performance of adults, specifically teachers, in recognizing children's mental states.

Finally, in Chapter 5 the relation between children's network position and their ability to read adults', and not children's, mental states was studied. Though practically not feasible at that point, it is obvious from the line of reasoning of this thesis that associations between children's network position and children's social cognition applied in this network of children are most validly approached by focusing on their social-cognitive skills in relation to children. Such improved contextual precision might contribute to establish an association between friendship network position and mental state reading between children. These associations between specific (contextually embedded) social cognition and corresponding social relationships and situations might be more precise and strong. However, a more general and overall relation between children's social functioning and various aspects of their social cognition, including skills to read adults' can be expected as well. The links found in Chapter 3 between peer popularity and prosocial behavior and both child and adult mental state reading cautiously indicate this.

An Educational Neuropsychology Perspective on Context and Social Cognition

The findings above were obtained from an educational neuropsychology perspective, the exploration of which was the second aim of this thesis. The current understanding of this interdisciplinary perspective was to investigate the social-cognitive skill of mental state reading with the paradigm of the Reading the Mind in the Eyes (RME) while taking into account the everyday school or societal context in which this skill is applied. Chapter 2 theoretically explored how a connection between two disciplines can take form. Moreover, this exploration focused explicitly on the connection between two disciplines one of which emphasizes the more fundamental understanding of processes while the other contains an essentially more applied element. In its relation to educational sciences and neuroscience, it was shown that there are different conceptions or positions for such an interdisciplinary field. These conceptions highlight either one of the involved disciplines (seeing educational neuroscience as part of neuroscience, or as part of educational sciences) or explicitly positions itself as an independent and separate field. Research questions, aims and approach are affected by the position the field of educational neuroscience takes. This consequently affects the possibilities to transfer findings to educational practice (Ansari, De Smedt, & Grabner, 2012; Geake, 2008, Howard-Jones, 2007; Pincham et al., 2014). Because of the correspondence between educational neuroscience and educational neuropsychology in their connection to a more fundamental and a more applied discipline, the theoretical exploration of these positions can be applied to the empirical chapters of this thesis. As Chapter 2 stipulated, it is

inevitable to take a certain position with regard to the connection between the disciplines involved in such interdisciplinary approaches. Applying the insights from Chapter 3 to the current empirical questions can serve the purpose of reflecting on an educational neuropsychology perspective in studying social cognition in context.

In this thesis, the contextual component of children's interactions with adults or with other children in their mental state reading and children's social cognition within the network of their class were examined. Further, the impact of cultural background on (bi-cultural) young adults' mental state reading was explored. These investigations all had the aim to understand social cognition within the daily life context in which it is applied. The specific components from this context were incorporated in the approach and research design, either by including them in the research instrument (the RME, Chapter 3 and 4) or in the research perspective (social network perspective, Chapter 5). This is different from the approach in which a component of the context is included in a design as a separate variable (Ashmore et al., 2004), for instance in the form of cultural background or setting. In that sense the current approach is less directed at understanding underlying principles or structures but at understanding social-cognitive skills as they are applied in a context. At the same time, although the aim is to understand these skills specifically within the educational (or societal, in Chapter 4) context, the question arises whether this can in fact be considered an 'educational aim' (De Smedt & Grabner, 2015). Such an aim would position these chapters as primarily part of educational sciences. It can be argued that research with an educational aim concerns itself through the entirety of the research process with the possibility of a practical application (Willingham, 2009). In the current empirical studies this is not the case. However, questions and approaches within educational research also differ in the extent to which this element is included. This reflects of course the width of and variety within disciplines themselves. Furthermore, it is in line with the observation in Chapter 2 that the distinguished positions of educational neuroscience are not final, fixed or static categories or the only options for this or a similar interdisciplinary field. Ultimately, it might be possible to signify the current approaches as relatively fundamental educational research.

An additional comment can be made regarding the current understanding and incorporation of context. Incorporating contextual components within the research approach itself is in line with a view on contextual embeddedness as a dynamic, bidirectional entanglement between layers of context and social-cognitive skills (Ashmore et al., 2004; Parigi et al., 2017). This is inherently different from approaching context as providing a static set of background traits that affect individuals similarly across different social situations (Parigi et al., 2017; Vogeley & Roepstorff, 2009). At the same time however such a nuanced understanding can be taken to different lengths (see for instance Roepstorff,

Niewöhner, & Beck, 2010). This emphasizes the need to be specific on how contextual involvement is understood. Further, Chapter 4 distinguishes itself from the other chapters since it evidently does not focus on the *educational* context. The insights this research, with this specific understanding of and approach to context, yield in terms of understanding social cognition as applied in any specific daily context, can be seen however as being in line with a more applied neuropsychological approach.

Finally, a critical note can be made concerning this characterization of the current empirical studies as educational or educational neuropsychological. Above it was discussed that these studies can be seen as more fundamental educational research because of the absence of a direct educational aim. The absence of such an aim does not imply that there are no implications for education, although these should be viewed with caution and are not directly applicable. The meaning of the insights of the current studies for education can be found, as is discussed more elaborately below, in a better understanding of aspects of children's social functioning that directly relate to their school life. Children's interactions with their teachers and their mutual understanding are a central part of their functioning and learning at school. Consequently, this interpretation validates the characterization of an (fundamental) educational neuropsychological approach. However, it can be said that the current studies do not represent the most obvious or direct educational or educational neuropsychological questions or interests. Such approaches can be found in studies that explicitly include a measure of school functioning, for instance linking a neuropsychological construct as self-control to grades at school (Tangey, Baumeister, & Boone, 2018). Furthermore, the current empirical studies contain elements from social psychology as well as developmental psychology and consequently strongly build on the literature from both of these disciplines. Consequently, it would also be possible to focus on the value of these insights of the current studies for these disciplines, placing the educational elements more at the background. It appears therefore, continuing on the conclusions of Chapter 2, that different interpretations of approaches or studies that contain elements from various disciplines, i.e. that are interdisciplinary, are possible.

Methodological Considerations

Several issues at the methodological level should be addressed. A central point concerns the validity of the RME task. The RME task is being applied widely, in a diversity of contexts as well as adaptations or translations (Oakley, Brewer, Bird, & Catmur, 2016, Peterson & Miller, 2012). It has however also received serious criticism, especially on its validity. First, there has been confusion as well as discussion on what exactly the task measures (Fernández-Abascal et al., 2013; Hallerbäck et al., 2009; Johnston, Miles, & McKinlay, 2008). The RME was in its final form introduced as an advanced Theory of Mind task that measures the

overall ability to attribute mental states to oneself or another person (Baron-Cohen et al., 2001). It has thereafter received different labels, including an advanced or complex Theory of Mind task, a mindreading task, or emotion recognition task. This inconsistent operationalization is confusing in itself. The label of a simple emotion recognition task appears to underrepresent mental state reading ability. Further, descriptions of the RME as an advanced or complex Theory of Mind task or as measuring mindreading can be confusing because they lack precision. Theory of Mind is an overall set of abilities, and mindreading is interchangeably used to refer to either specific Theory of Mind skills including but not limited to mental state reading (see for instance Lonigro et al., 2014) as well as to encompassing Theory of Mind (see for instance Slaughter & Perez-Zapata, 2014). Consequently, the RME would first of all benefit from a precise and consistent operationalization, by referring to it as measuring the specific skill of reading (or decoding or inferring) mental states based on immediately available information in facial expressions (Bora, Eryavuz, Kayahan, Sungu, & Veznedaroglu, 2006).

At the same time however, this inconsistent reference to the RME might reflect a more difficult issue concerning the exact meaning of the skill measured with this task. The question remains whether mental state reading can be referred to as a Theory of Mind skill or whether it should after all be seen as an emotion recognition related skill. The RME was originally introduced as a Theory of Mind task, yet can be seen as unusual in this regard because of its inclusion of emotion states and reliance upon the detection of facial cues (Oakley, Brewer, Bird, & Catmur, 2016). Most tasks that measure aspects of Theory of Mind involve the inference of non-emotional mental states from contextual information or dynamic behavioral cues (Oakley et al., 2016). Empirically, the notion of the RME skill being part of Theory of Mind is based primarily on the lower performance on the task in individuals with autism spectrum disorder (who are known for their low Theory of Mind abilities) compared to a normative group of individuals (Oakley et al., 2016). This in itself limited evidence has recently been questioned by findings that the lower performance of individuals with Asperger syndrome on the RME is due to alexithymia (a trait characterized by poor recognition of one's own emotions) and not Theory of Mind. An alternative therefore is to consider mental state reading an ability comparable to emotion recognition. This interpretation has face validity, but at the same time the RME clearly distinguishes itself from the more basic emotion recognition tasks because of the involvement of complex mental states as well as simple emotions. The requirement of possessing cognitive knowledge of these complex states (Fernández-Abascal et al., 2013) suggests that emotion recognition underrepresents what the RME measures. Ultimately this debate involves a precise inquiry into the relations between mental state reading, emotion recognition and Theory of Mind.

A second, related concern with the RME that can be noted is the lack of established correlations to other constructs, further complicating a precise

understanding of the mental state reading construct. The most consistent finding is a higher performance on the task of females (Vellante et al., 2013). However, this finding, which is in line with a gender difference on abilities such as empathy (Christov-Moore et al., 2004) and emotion understanding (Cutting & Dunn, 1999), has recently appeared less robust (Vellante et al., 2013). Other investigations into the association between RME performance and IQ, emotion recognition, empathy and Theory of Mind are inconsistent as well (Baron-Cohen et al., 2001a; Brent et al., 2004; Peterson & Miller, 2012; Spek et al., 2010; Vellante et al., 2013). The findings from Chapter 3 (confirming that mental state reading was linked to peer popularity and prosocial behavior, yet showing small effects) and Chapter 5 (showing no significant links between mental state reading and peer and friendship network centrality) as well do not clarify how mental state reading is associated with other constructs.

Further, some additional points can be brought forward that concern the adaptations of the task made for the current purpose. Two adapted versions of the Reading the Mind in the Eyes task were created for the investigation of the contextual embeddedness of mental state reading. The procedures of creating these adaptations were highly similar. Both modifications of the RME had the aim to incorporate a contextual component in the task in order to create, combined with the original task, a specific contrast within this contextual component (child vs. adult in Chapter 3, and Antillean/Moroccan vs. Western in Chapter 4). Such newly created tasks have the disadvantage that their validity and reliability has not been established (although in the case of the child task, this was an aim in itself of Chapter 3). Their advantage however is twofold. These tasks can serve the purpose of allowing the type of comparisons as included in Chapter 3 and 4, gaining insight in the effects of the contextual components included in the tasks. Further, they can be applied as instruments that might, because of this contextual incorporation, be more valid to assess in this case the daily mental state reading level of a specific group (children in Chapter 3, and individuals with an Antillean or Moroccan background in Chapter 4). Related to this approach of adapting the RME is a consideration of its reliance upon static and posed instead of dynamic and genuine facial expressions (Johnston et al., 2008; Krumhuber, Kappas, & Manstead, 2013). Most importantly for the current purpose, the RME originally aims to measure mental states in the face specifically not taking into account the context that surrounds this face (Baron-Cohen, Wheelwright, Hill, Raste, & Plumb, 2001). This implies that even when the task is adapted specifically to include certain contextual features, the reliance upon only the face can continue to impact its validity. This is especially the case when the task is completed by individuals who are to different extents used to incorporating the situation surrounding a face when inferring emotions (Matsumoto & Hwang, 2010).

Finally, these different questions on the RME are important to take into account, also when interpreting the findings of this dissertation. A distinction

should be made however between on the one hand confusions that can be dealt with by precise and consistent operationalization's and transparency on the limitations of the task and the insights it yields, and on the other hand the more serious issues that ask for further investigation as well as a cautious interpretation of findings with the RME. It should also be kept in mind that in any social interaction individuals have multiple skills at their disposal, which they can apply as needed. Moreover, other processes such as empathy and prosocial behavior can be involved in social interactions as well, perhaps operating in the previously mentioned possible gap between the possession of a skill and its use (Caputi et al., 2012; Lonigro et al., 2014).

Future Directions and Implications

A first important direction for future research is to confirm the link between underlying differences in development or cognitive frameworks and specific social-cognitive styles. To understand exactly why children are better at reading mental states of other children than of adults, it is necessary to identify specific stylistic differences within the expressions of both children and adults. Moreover, it can be attempted to link these stylistic differences to a developmental trend or to roles of children and adults. Concerning culture, the grounding of emotional expression styles in interpersonal goals and values associated with culture should be confirmed (De Leersnyder, 2017; Elfenbein & Ambady, 2003; et al., 2012; Oyserman, 2011).

Second, it would be highly relevant to assess the consequences of (individual differences within) the contextual embeddedness of social cognition. There are quite some insights on patterns of emotion recognition or regulation of individuals with a bicultural background and its associations with adaptations (see for instance Consedine, Chentsova-Dutton, & Krivosheikova, 2014). Yet the idea of social cognition being embedded in a context and consequently being shaped by and at the same time shaping its surroundings always contains the possibility of impacting individuals' functioning. Such consequences are not confined to context in the form of culture. A first direction here is to explore the extent to which children's advantage in reading other children's over adults' eyes impact their interactions with adults. Both the role of children themselves and the role of adults can be investigated here. A second direction involves the different positions children can take in the network of their class as well as possible differentiation in use of their social-cognitive skills within these positions. It is also interesting to consider how high social cognition can have different effects within a classroom dynamic. These might not all be positive. In addition to children possibly using their social-cognitive skills in an anti-social way (Lonigro et al., 2014), children with high social-cognitive skills have been shown to be especially sensitive to teacher criticism (Cutting & Dunn, 2002), which can negatively impact their school achievement in the long term (Caputi et al., 2014). Finally, the lack of

an in-group advantage in the young adults with a bicultural background of Chapter 4 can be seen as positive since it suggests competent navigation through different social situations these individuals might encounter. This should be confirmed though, especially since overall, their mental state reading was lower than that of Dutch young adults. Their own underlying experience of their closeness to both cultures can be important to take into account here as well.

Finally, some cautious implications of the current findings for educational or societal practice can be considered. It should be kept in mind that informing these practices was not an aim of the empirical chapters. However, all chapters provide some starting points for an understanding of these topics at a more practical level. The findings from Chapter 3, especially children's lower ability to read mental states of adults, are relevant to understand communication between children and adults which takes place in various settings, including at school. It can be important that teachers are aware that their facial emotional expressions are comprehended less well by children than these children comprehend each other's expressions of mental states. Also, it should be kept in mind, not only for the purpose of research but also practically, when children's "actual", daily life mental state reading (and possibly other social-cognitive) ability is accurately captured. Under- or overestimation of level of social-cognitive functioning can take place because of disregard of contextual effects. Further, Chapter 5 involves children's social functioning at school as well. These findings, however, provide limited starting points for specific implications because of the lack of effects. Yet, generally insights in such classroom dynamics have a wide relevance to understanding social and school functioning. A more nuanced understanding of children's relationships at school and their possibly different uses of various social-cognitive skills can provide helpful starting points for teachers to understand and improve the social climate within a class and specific cases of children within various social network positions. Finally, Chapter 4 has implications for adaptation of individuals with a bicultural background as well as for intercultural communications. Such insights on bicultural (or any cultural) groups should be carefully interpreted because of individual variation within these groups. Generally speaking however, the lack of an in-group advantage in the present bicultural groups can be seen as positive. It suggests that competent ability of individuals with Antillean-Dutch and Moroccan-Dutch backgrounds supports competent navigation through different intercultural social interactions they might encounter. However, the patterns of the Dutch group, showing the higher ability to read Western eyes, do point towards a possibility for misinterpretations and miscommunications within intercultural interactions.

Conclusion

This thesis explored the contextual embeddedness of the social-cognitive skill of mental state reading from an educational neuropsychology perspective. This

exploration included an explicit theoretical consideration of how such an interdisciplinary perspective can be applied. It was shown how mental state reading of children and young adults is intertwined with contextual components of the interaction in which it is applied. Specifically, this was the case for both a developmental and a cultural characteristic of the individuals who are interacting. Further, the exploration of a social network perspective within the context of social relationships did not confirm expected relations between children's network position and their mental state or social mindfulness skills. This points towards the possibility that complex management skills become important only at a later age. Overall, these findings add to the understanding of social-cognitive processes as these are utilized in various daily life social situations. Moreover, they stress the importance of being aware of and possibly incorporating contextual components when assessing and interpreting social-cognitive skills. Further, the examination of the interdisciplinary perspective that was applied here elucidated first of all the different directions and contributions of this perspective. Perspectives such as educational neuroscience and educational neuropsychology have a substantial range in possibilities both in understanding fundamental processes that are relevant for educational practice (or, societal practice) and in exploring ways to apply these findings to or inform these practices. However, in order to achieve these diverse aims it is necessary to determine and follow the specific direction any educational neuroscience or neuropsychology study takes. The present insights are ultimately more fundamental in nature. Their approach to and explicit incorporating of context opens up avenues for research that can include a direct transfer to practice. This is a highly valuable way to eventually optimize children's as well as young adults' navigation through social life.

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