Chapter 7
General Discussion
The general aim of this thesis was to contribute to the understanding why children with poorer neurocognitive abilities are more likely to develop multiple types of problems, including symptoms of psychopathology, delinquency and academic failure. Although certain less well developed neurocognitive abilities may directly link to the development of such problems, the social context may also play an important role in explaining why children with poorer cognitive abilities are at increased risk of developing maladaptive outcomes, as was hypothesized in the introduction of this thesis. Therefore, the studies in this thesis addressed the social relational processes in trying to understand the developmental pathways of children’s neurocognitive abilities towards maladaptive outcomes.

In this chapter, we first summarize this thesis’ findings with respect to the influence of several aspects of neurocognitive functioning (i.e., language skills, working memory and cognitive impulsivity) on each of the outcome domains studied. Second, findings are reviewed on the question whether peer relationships should be considered when trying to understand the pathways through which children with poorer cognitive abilities develop externalizing behavior and academic problems. The third part of this section focuses on the question whether parenting behaviors and peer relationships may create a context in which children with poorer neurocognitive abilities are more likely to be delinquent across adolescence and early adulthood. Fourth, the question is addressed whether peer relations can be used as an intervention tool to reduce the risk of children with poorer cognitive abilities (i.e., poorer language skills) of developing psychopathological problems. Finally, we address whether the findings on the role of social relations in understanding the link between neurocognitive abilities and maladjustment apply equally to boys and girls. After reviewing this thesis’ main findings, their theoretical implications, methodological strengths and limitations, implications for practice and suggestions for future research are discussed.

Do Neurocognitive Abilities Predict Children’s Deviant Development?

Across our empirical studies and regardless of our operationalization of neurocognitive abilities (i.e., language skills, working memory, cognitive impulsivity) support was found for an association between cognitive abilities and the deviant developmental outcomes. In chapter 2, children with poorer language skills were found to show increasing levels of externalizing behavior problems in elementary school, as opposed to children with better language skills, who showed decreases in externalizing behavior. Chapter 3 showed that children’s academic success in late elementary school depended upon their working memory abilities. Put differently, children with lower working memory ability were more likely to have poorer academic achievement at the end of elementary school. Finally, in chapters 4 and 5, we studied the period of late childhood to early adulthood in which we focused on the age-crime curve (Farrington, 1986). This curve describes the typical increase in delinquency during the adolescent years which peaks in mid to late adolescence, followed by a gradual decrease in delinquency towards adulthood as found among western
youths. From these chapters, it became clear that youths who scored higher on cognitive impulsivity in late childhood showed a more pronounced increase in delinquency during adolescence, which consequently resulted in a higher peak in delinquency during mid to late adolescence.

The differences found in deviant development as a function of neurocognitive abilities were not only statistically significant, the results were also clinically relevant. To illustrate, the results in chapter 2 showed that the relative difference in externalizing behavior between children who had poor versus adequate language skills doubled over the period of kindergarten to fourth grade elementary school. With regard to the academic achievement as studied in chapter 3, it is important to note that the academic achievement test used in this study is used to determine the entry level of secondary school education of children (Van Boxtel, Engelen, & De Wijs, 2011). Our findings showed that children with working memory scores within the lowest quartile had on average academic achievement test scores that yielded a middle-management-oriented, pre-vocational secondary school level (Dutch: vmbo kaderberoepsgerichte leerweg). In contrast, the children in the highest quartile of working memory scores had on average an academic achievement test score that allowed them to follow higher general secondary education (Dutch: havo). Finally, with regard to the delinquency curve studied in chapters 4 and 5, we found that in the at-risk urban male sample, the estimated probability of being arrested at age 17 (peak of the curve) was 33 percent when cognitive impulsivity was low, compared to 52 percent when youth were high on cognitive impulsivity.

These findings clearly confirmed earlier theoretical and empirical work showing that poorer neurocognitive functioning puts children at risk of developing early behavior problems that likely increase in severity with age (Hill, 2002; Loeber & Hay, 1997; Moffitt, 1993; Ogilvie, Stewart, Chan, & Sum, 2011), as well as impeding children’s academic development (Alloway & Alloway, 2010; Alloway, Gathercole, Kirkwood, & Elliott, 2009). More importantly, the marked differences found between children with high versus low neurocognitive test scores on the adverse outcomes studied in this thesis indicate that children at the low end of neurocognitive abilities are at increased risk of developing multiple adverse outcomes. In fact, given the predictive power of behavioral problems, delinquency and academic achievement in forecasting serious maladjustment (Fergusson, Horwood, & Ridder, 2005; Woodward & Fergusson, 2000), they suggest that having poorer neurocognitive abilities may impede children’s adaptive behavior and academic development also on the long term, as well as increase the risk of developing mental disorders, convictions, substance (ab)use, and future job/work failure (Fergusson et al., 2005). This highlights the importance of understanding the pathways how and conditions under which such poorer cognitive abilities may express themselves into these adverse outcomes. In this thesis, this was done by studying the role of peers and parents in understanding why children with poorer neurocognitive abilities are at increased risk of developing adverse outcomes. In
the following sections, the findings on the role of relationships with peers and parents in these pathways are discussed.

**Do We Need to Account for Peer Relations to Understand the Pathway Through Which Neurocognitive Abilities Predict Childhood Maladjustment?**

The first set of studies (chapter 2 and 3) focused on the question whether social experiences with peers should be considered to understand the pathway through which children’s cognitive abilities express themselves into behavior problems and poorer academic achievement. Two domains of peer risks were studied in these chapters, namely the extent to which a child is rejected by its peers, and the affiliation with deviant friends. Across the studies and across the outcomes studied (behavior problems or academic achievement), it was shown that peer relationships may indeed explain in part why children with poorer cognitive abilities end up developing deviant outcomes. More specifically, the results in chapter 2 showed that children with poorer language skills, as compared to children with better language skills, were gradually more rejected by their peers, which explained why these children developed more externalizing behavior across the first four years of elementary school. Moreover in chapter 3, in addition to the direct effect of working memory on academic achievement, both experiences of peer rejection and affiliation with aggressive friends (but not the child’s own conduct problems) were found to contribute to the explanation why children with poorer working memory have poorer academic achievement at the end of elementary school.

These findings are in line with the theoretical notion that poorer neurocognitive functioning (both verbal and executive functions) may increase the risk of developing adverse/deviant outcomes through the difficulties these children experience in developing successful social relationships with mainstream peers (Nigg & Huang-Pollock, 2003). They also extend previous empirical studies that generally examined only part of the mediational link (Buhs & Ladd, 2001; Ladd, 2006; Newcomb, Bukowski, & Pattee, 1993; Parker, Rubin, Erath, Wojslawowicz, & Buskirk, 2006; Rinsky & Hinshaw, 2011; Slaughter, Dennis, & Pritchard, 2002; Snyder, Prichard, Schrepferman, Patrick, & Stoolmiller, 2004). Collectively, the findings from chapters 2 and 3 show that poorer neurocognitive abilities may have multiple pathways leading to multiple poor outcomes. The poorer neurocognitive abilities may directly place children at risk of performing less well in school, and showing behavior problems. However, part of the impairments that poorer neurocognitive abilities impose do not directly link to such outcomes and can be better understood when accounting for the social relational difficulties or risks that children with poorer neurocognitive abilities likely encounter. Their poorer language skills and working memory abilities might hamper these children’s abilities to understand the complex emotional and social intentions of peers correctly, to express their own emotions in a social manner, to learn social rules, or to suppress impulsive choice behavior. As a consequence, these children may experience
difficulties in building satisfying relations with peers, and may become rejected by their peers or affiliate with deviant friends. These poor social experiences thus seem to become part of the explanation why these vulnerable children develop behavior problems and have academic difficulties.

Do Relationships with Peers and Parents Provide a Context in Which Neurocognitive Abilities Predict Maladjustment?

Our findings also provided support that the development of delinquent outcomes among children with poorer cognitive abilities depends upon parenting behaviors and the behavioral characteristics of peers. Specifically, the findings in chapter 5 showed that delinquency across adolescence and early adulthood was only predicted by cognitive impulsivity in the absence of a social environmental risk. Put differently, when parents provide a good rearing context by disciplining their child in a consistent manner, positively reinforcing good behavior and making certain that they know the whereabouts of their child, and when a child does not have delinquent friends, the cognitive risk of the adolescent may express itself in more delinquent behavior. In contrast, when parents do not provide a good rearing context, and when a child affiliates with delinquent friends, the intrinsic risk of the child (i.e., the cognitive impulsivity) does not matter any longer in predicting delinquency.

These findings indeed show support for a moderating role of parenting behaviors and peer relationships in the link between cognitive abilities and the development of deviant outcomes. However, it may not be the typical moderating role that might be expected. Our findings showed that cognitive risks are likely most influential on delinquency development in the absence of a social risk. When parents do not employ adequate rearing styles or when the child has delinquent friends, such social experiences appear to overshadow the impact of the cognitive/biological vulnerability on these children’s prediction of delinquency. This type of moderation is in line with the social push hypothesis (Mednick, 1977; Raine, 2002). Thus, our findings indicate that being cognitively impulsive, as was studied in chapters 4 and 5, predicts the development of delinquency over the adolescent and early adulthood years. However, when such children grow up in a poor social environmental context, their neurocognitive risk does no longer add to the prediction of their delinquency curve, likely because it has been overshadowed by the contextual risk.

Can We Reduce the Risk of Developing Psychopathological Problems Among Children with Poorer Neurocognitive Abilities by Improving the Peer Context?

So far, our findings suggested the necessity to account for the social environment in order to understand why children with poorer neurocognitive abilities develop maladjustment problems. A final question addressed in this thesis was therefore whether it is possible to reverse this process. That is, whether improving the social context would result in reductions of behavioral and emotional problem development especially among children with poorer
neurocognitive abilities. Therefore, in chapter 6, the results of a study on the effects of a preventive intervention aimed at, among others, facilitating positive peer interaction in the classroom (i.e., the Good Behavior Game, GBG; Barrish, Saunders, & Wolf, 1969) on the development of behavioral and emotional problems were presented. Children who received the intervention were found to show reductions in their behavioral and emotional problem development when compared to control group children. This effect was partially explained by the improvements in peer acceptance among children who received the GBG. More importantly for this thesis, it was found that this mediational pathway applied only to boys who had poor language skills. Put differently, by facilitating positive peer interactions, the GBG likely made it less challenging for children to develop satisfying social relations with peers. This study showed that the explanation of why boys with poorer language skills, who are theorized to especially experience difficulties in building satisfying peer relations, benefitted from the program was partially because the GBG made it possible for them to become more liked by their peers.

In addition to the findings from chapters 2 and 3, the findings from chapter 6 provided further evidence for the explanatory role of peer relationships in understanding the pathway through which children with poorer neurocognitive abilities develop multiple types of problems. More importantly, the results suggest that the role of peer relations in the developmental pathway of neurocognitive risk to maladjustment is two-fold. It explains – in part – why children with neurocognitive risks end up development poor outcomes. It simultaneously provides an avenue for intervention for the same children. When an intervention is aimed at facilitating positive peer relations, especially children with an increased risk of developing problems due to their poorer neurocognitive skills may benefit most of this.

**Do the Results Apply to Both Boys and Girls?**

We found some indication that especially boys who have poorer neurocognitive abilities are at risk of encountering maladjustment problems. Indeed, the results from chapter 2 indicate that boys not only have higher levels of externalizing behavior and lower levels of peer social preference than girls, they also suggest that the developmental pathway found in this study applied mostly to boys. More specifically, being rejected by peers especially influenced the development of externalizing behavior among boys. The findings in chapter 3 put forward that affiliation with aggressive friends only linked working memory with academic achievement in boys, as poorer working memory was found to increase the risk of affiliating with aggressive peers in boys only. Finally, the intervention induced improvements in peer acceptance, as described in chapter 6, explained the reductions in the development of behavioral and emotional problems only in boys with poor language skills.

It is important to note that across the studies, the child’s sex was found to affect different parts of the mediational path with respect to experience of peer rejection and
affiliation with deviant friends. It was the response to the experience of rejection that was found to more strongly predict externalizing behavior among boys than girls. In contrast, working memory was a stronger predictor of the selection of aggressive friends among boys compared to girls. Thus, boys not only experience more social relational risks than girls during the elementary school period (Moffitt, Caspi, Rutter, & Silva, 2001). The findings in this thesis also suggest that boys may be more influenced by certain adverse social experiences than girls, or may evoke more at risk social experiences due to their poorer cognitive abilities than girls. This might explain why boys are more at risk of developing deviant outcomes such as antisocial behavior (Moffitt et al., 2001) or school dropout (Statistics Netherlands, 2012b).

In sum, over the chapters was found that children’s cognitive functioning has a profound impact on the risk these children have to develop multiple adverse outcomes in the elementary school period, adolescence and early adulthood. More importantly, the studies in this thesis demonstrated that, in order to understand why these cognitive abilities are linked to such adverse outcomes, we need to (also) consider the social experiences such children encounter. Both peer relationships and the behavior of parents seem to explain – in part – why or under what conditions these children with poorer neurocognitive abilities end up developing multiple types of problems that may seriously impede their future societal functioning. Some of these pathways may be more influential to boys than to girls.

Theoretical Implications

This thesis’ findings have implications with respect to developmental theory. Our findings underscore the importance of both the child’s cognitive functioning (both verbal and executive functioning impairments) and its problematic social relationships with peers and parents as (underlying) risk factors in understanding the development of multiple adverse outcomes (Moffitt, 1993; Parker et al., 2006; Rutter, 2003). More importantly, our findings also indicate that it is too simple to view the personal cognitive and social relational factors only from a main effects perspective or from an additive risks perspective. In line with theoretical notions on behavioral development (Moffitt, 1993; Nigg & Huang-Pollock, 2003), evidence was found for an interplay between social relational risk and neurocognitive risks in explaining the development of maladjustment problems.

Regarding this interplay, a child’s poorer neurocognitive abilities may lead to deviant developmental outcomes because it hampers the child to build proper social relationships. That is, this thesis’ results indicate that children with poorer cognitive abilities evoke such adverse responses from others (e.g., peer rejection) or actively select a risky social environment (e.g., deviant friends), which in turn add to the development of deviant outcomes. Evocation and selection may be the result of, for example, difficulties with understanding others, inhibiting inappropriate behavior and impulsively choosing, all due to
cognitive limitations. The resulting developmental processes are comparable to gene-environment correlations (Rutter et al., 1997).

Our findings also provided support for a second form of interplay between neurocognitive risks and social relational factors, namely a moderation mechanism by showing that the risk of a cognitively vulnerable child depended on the social relational context in which the child lived. More specifically, being cognitively vulnerable only increased the risk of following a deviant developmental pathway (e.g., delinquency) in the absence of a social environmental risk. This mechanism is comparable to a gene-environment interaction (Rutter et al., 1997). Thus, our findings suggest that the developmental mechanisms described with respect to the role of genes and the environment seem to apply also to endophenotypes of brain functioning. It may even be that the underlying genetic risk expresses itself through endophenotypes including cognitive functioning (as they are described to be highly heritable; Plomin, DeFries, McClearn, & Rutter, 1997), which in turn puts children at risk of developing deviant behavioral but also social outcomes. It would be interesting to test this hypothesis in future research.

In addition, it is important to note that our findings suggest that some of the developmental mechanisms studied in this thesis may not apply equally to boys and girls. As described earlier, several of the pathways examined in chapters 2, 3 and 6 were found to apply mostly to boys. These findings support the idea that boys may be more vulnerable in general to develop behavioral and peer relational problems, and that their future behavioral development might also be more influenced by these problems (Moffitt et al., 2001). In the dominance/status-oriented and competitive culture of boys’ same gender peer groups, boys may be more likely to befriend other boys, who tend to be more aggressive on average than girls (Maccoby, 1998; Moffitt et al., 2001; Parker et al., 2006). Our findings suggest that this might be especially true for boys with poorer cognitive abilities. In addition, the effects of social problems on the development of deviant social outcomes might be stronger for boys, because social status within the larger peer group might be more important for boys (Rose & Rudolph, 2006). Once this status is threatened (for instance when being rejected), boys may react more negatively, presumably by showing behavioral problems (Rudolph, 2002), or are more likely to use coercive strategies as a response to rejection compared to girls (Snyder et al., 2004). These hypotheses should be further examined in future studies.

It is also important to mention the possible role of IQ with respect to the mechanisms studied in this thesis. IQ itself is also described as a predictor of outcomes such as delinquency and academic achievement, and the cognitive functions studied in this thesis are described to be correlated with IQ (Alloway & Alloway, 2010; Hodapp & Gerken, 1999; Koolhof, Loeber, Wei, Pardini, & D'Escury, 2007). However, our findings indicated that, even with general IQ in the model, cognitive impulsivity played a role in predicting the development of delinquency in chapters 4 and 5. More importantly, with the focus of this thesis in mind, it must be noted that it could be considered a strength that we used specific
measures of cognitive functioning instead of a general IQ measure. When trying to understand the pathways through or conditions under which neurocognitive abilities lead to maladjustment, it is important to use specific neurocognitive measures that may impose specific impairments related to the pathway of interest. The specific cognitive abilities studied in this thesis were theoretically plausible candidates to study in relation to the social experiences of children. The specific impairments as imposed by the limited cognitive abilities tapped by our measures likely influenced the social experiences these children encountered, or their influence could depend upon the social context of these children. A general IQ measure would be less specific, making it difficult to understand what aspect(s) of general IQ particularly drove the results.

Methodological Strengths and Limitations

Although methodological strengths and limitations of each study are described in more detail in the chapters, several methodological strengths are provided in the following section. First, each hypothesized developmental mechanism was investigated in a longitudinal study design, in which participants were followed over multiple years, ranging from 2 to 19 years. In these longitudinal studies, repeated assessments of social relationships and symptoms of (externalizing) psychopathology across multiple years of elementary school, as well as repeated measures of delinquency from late childhood into early adulthood. Combined, the studies in this thesis covered a very large age period, from kindergarten up to age 29. Another advantage of using longitudinal data is the possibility to study individual development while controlling for initial levels of the constructs. Moreover, one of the studies even used an experimental longitudinal design to examine the role of peer acceptance in the development of symptoms of psychopathology in children with an increased risk by manipulating peer interaction with a preventive intervention. This method is a unique way to test developmental theory (Hinshaw, 2002; Kellam & Rebok, 1992). Another strength is the use of multiple different statistical models to analyze the developmental pathways, including latent growth, structural and generalized estimating equation models.

Second, the studies in this thesis each used data from multiple informants to assess cognitive functioning (psychometric test scores), peer relationships (peer nominations, parent and self reports), symptoms of psychopathology (teacher reports), academic achievement (standardized Dutch national End of Primary School Test) and delinquency (official arrest records). The associations found between the variables could thus not be explained by the fact that they were obtained from the same informant. Another strength with respect to the measures is the use of standardized psychometric tests to assess multiple different aspects of neurocognitive functioning (both verbal and executive functioning tests). Such neurocognitive tests are likely more objective compared to more subjective behavior ratings, for example of inattention/impulsivity or self-control. Psychometric test scores are also
independent from the outcome measures used in this thesis, whereas behavior ratings likely show overlap with outcomes such as externalizing behavior problems and delinquency.

However, this thesis’ studies also have several limitations. First, the results found in the studies might not be generalized to the population at large. This applied to the Dutch sample used in chapters 2, 3 and 6, as this sample was comprised of children from elementary schools in two urban areas in the western part of the Netherlands and a rural area in the eastern part. Participating schools were not randomly selected. Moreover, the studies described in chapters 4 and 5 were conducted using an at-risk urban male sample from the inner-city of Pittsburgh, the Pittsburgh Youth Study, making it unclear whether the findings also apply to a more general sample of males or to females.

Second, each of the cognitive measures was assessed only at one point in time. Although individual differences in cognitive functioning tend to be rather stable over time (Alloway et al., 2009; Biederman et al., 2007; Bochner, 1978), it would be important to retest our hypotheses with cognitive functioning assessed repeatedly. Moreover, despite the inclusion of multiple aspects of cognitive functioning in this thesis’ combination of studies, there may be other cognitive functions that could play an important role in the hypothesized developmental mechanisms examined in this thesis. For instance, language skills were only assessed with a receptive vocabulary test, thereby ignoring other aspects of language skills such as expressive language and verbal IQ that might also be important for social functioning. Therefore, in addition to repeated measures, multiple forms of cognitive functioning should be examined in future studies.

Third, although the studies in this thesis cover a broad age range together, it is not clear whether the mechanisms found in the elementary school period also apply to adolescence and adulthood and vice versa. Therefore, it would be interesting to test the mediation hypothesis in adolescence and adulthood, and the moderation hypothesis in childhood. In addition, as several scholars suggested, the mechanisms studied in this thesis might have their origins even earlier in life, and deviant development accumulates from infancy onwards (Keenan & Shaw, 1997; Moffitt, 1993; Nigg & Huang-Pollock, 2003). Therefore, it would be important start following children as early as possible.

Finally, despite the longitudinal (experimental) design, the associations found do not imply causal links. It is also possible that other factors, for example genetic influences, account for the associations found between cognitive abilities, social relational factors and deviant developmental outcomes (Kendler et al., 2007; Koenen, Caspi, Moffitt, Rijsdijk, & Taylor, 2006). Therefore, it would be interesting to retest our hypotheses in a genetically sensitive design.

**Implications for Practice**

In this thesis’ studies, social relationships were found to add to the explanation why children with poorer cognitive abilities are at increased risk of developing multiple types of
problems, including behavioral, emotional and academic problems and delinquency. These findings have several implications with respect to prevention and intervention. First, practitioners should focus on children’s cognitive abilities, as they may be an indirect precursor of developing adverse outcomes (e.g., by using neurocognitive tests for screening purposes). When practitioners encounter a child with neurocognitive impairments (e.g., poorer language or working memory skills), they should pay attention to the child’s social relational context, as the cognitively impaired child might evoke or already have problematic relationships, increasing the risk of problem development or providing the context in which cognitive impairments express themselves in adverse outcomes. Prevention/intervention should therefore focus on methods aimed at improving cognitive functioning (e.g., with working memory training; Van der Molen, Van Luit, Van der Molen, Klugkist, & Jongmans, 2010) or reducing direct consequences of cognitive impairments (e.g., attention/concentration and inhibition enhancing medication). However, it should also focus on the social relational context of children with poorer cognitive abilities. In fact, results from the pathway analyses in this thesis showed that children with poorer neurocognitive functions are at increased risk of experiencing peer rejection or affiliation with deviant peers, which have been shown to predict adverse outcomes themselves (Deater-Deckard, 2001; Parker et al., 2006). This can be seen as a cascading or snow-balling effect, in which the initial cognitive risk expands to other, social relational domains that increase the risk of these already vulnerable children, which underscores the importance of improving their social relationships.

This thesis’ findings showed that relationships with peers and parents both play a role in the explanation why children with poorer cognitive abilities develop adverse outcomes. Intervention should therefore focus on improving peer and parent relationships, also because these poor relational experiences may have a unique predictive link towards maladjustment (Deater-Deckard, 2001; Hoeve et al., 2009; Loeber & Stouthamer-Loeber, 1986; Parker et al., 2006). For example, universal interventions such as the Good Behavior Game aimed at facilitating positive peer interaction in the classroom may be used, and should be combined with parent components. However, such classroom interventions should also have a targeted component in which children with poorer cognitive functions learn how to interact with peers, for instance to help them interpret social information or emotions, prevent them from affiliating with deviant/delinquent friends, and to make them less susceptible to the possible negative influences of hanging out with deviant friends. Interventions aimed at positive parenting, such as improving their knowledge about the whereabouts of their child, teaching them to be persistent in their disciplining, and emphasizing to focus on positive reinforcement, may also protect children/young adolescents against a deviant development. Such interventions likely have a greater chance at success when combined with interventions aimed at reducing children’s cognitive risk.

Another practical implication refers to the timing of intervention. As childhood behavioral, emotional and academic problems are predictive of serious negative outcomes,
including delinquency, substance use, social impairment, mental health problems, academic failure and unemployment (Fergusson et al., 2005; Roza, Hofstra, van der Ende, & Verhulst, 2003; Woodward & Fergusson, 2000), it is important to try to prevent vulnerable children from following such deviant developmental pathways as early as possible. Moreover, as children with poorer cognitive abilities were found to be at risk of developing increasingly problematic social relationships in the first four years of elementary school, and problematic peer relationships have been found to be highly stable over time (Jianga & Cillessen, 2005), it is important to prevent these vulnerable children’s social problems as early in life as possible.

In all, this thesis’ findings suggest that a combination of intervention efforts would be the best way to reduce cognitively vulnerable children’s risk of developing adverse outcomes. That is, in addition to trying to reduce (effects of) cognitive impairments (which may be more difficult to change, as they are relatively stable; e.g., see Biederman et al., 2007), early efforts to help these vulnerable children to successfully engage in social relationships likely reduce their risk of developing multiple types of problems. Moreover, providing a protective/low-risk social context would also reduce their risk of developing problems.

**Directions for Future Research**

The findings from the studies in this thesis suggest that it is important to study both cognitive child risk variables and social relational factors when investigating the development of deviant outcomes, and not only as main effects. Not studying the role of social relationships in the link between cognitive functioning and deviant outcomes might incorrectly suggest that associations found between cognition and outcome are direct, while they may actually be (also) driven by social relational mechanisms. Furthermore, taking social relational factors into account as possible moderators may also lead to different conclusions with respect to the effects of cognitive functioning on deviant development, as cognitive risk may be overshadowed by social environmental risks but visible in a good social environment (cf., Raine, 2002). Future research should therefore take such mediating/indirect or moderating mechanisms into account.

In future research, it would also be interesting to examine the processes through which poorer cognitive abilities lead to social difficulties. For example, it would be important to establish whether factors as impulsively choosing, difficulties with social information processing or inhibiting inappropriate behavior play a role in this link. Moreover, it is important to investigate the effects of (early) interventions aimed at improving social relationships on long term problem development, that is, testing whether the accumulation of increasingly severe problems of cognitively impaired children could be interrupted by (early) improvements of their social relational context. Such long term effect studies would be important for theory development as well as prevention efforts.
In addition to testing effects of cognitive functions on social development, it would also be important to examine the effects of having problematic social relationships with for instance peers on children’s cognitive development in future research. As demonstrated by Baumeister and colleagues, the experience of social exclusion had a negative impact on multiple aspects of more complex cognitive functions in adults (Baumeister, Twenge, & Nuss, 2002). Cognitive and brain functioning is continuously developing in childhood and adolescence (Casey, Giedd, & Thomas, 2000), and negative social experiences may hamper this development, particularly when these social problems start early and remain relatively stable across elementary school. Thus, it would be interesting to examine transactional effects between social relationships and cognitive functioning in a longitudinal design.

Conclusions

The findings presented in this thesis sharpen our insights into what places children with poorer neurocognitive abilities at increased risk for developing multiple (long term) deviant outcomes. Our findings stress the importance of both poor cognitive abilities and problematic social relationships in this development, but more importantly, they indicate that it is likely the interplay between or additive effects of both types of risk factors that best explains developmental pathways towards deviance. More specifically, they suggest that the social environment or “nurture” adds to the explanation why children vulnerable by “nature” develop multiple types of problems. To come back to what was put forward in the general introduction, the phrase “nature via nurture” seems to be the best way to describe the role of cognitive and social relational factors in behavioral development. To view them separately or as oppositional influences, thus “nature versus nurture”, would likely be insufficient to explain deviant developmental pathways.

Although these findings suggest that biologically/cognitively vulnerable children are extra at risk of developing deviant outcomes because of the social relational difficulties they may encounter, they also provide a more positive message. It suggests that changing children’s social relations may provide another avenue to reduce these vulnerable children’s risk of developing problems, in addition to attempts at improving relatively stable cognitive abilities. Thus, despite their relatively stable biological/cognitive risk, these vulnerable children may not be destined to end up with severe psychopathological, academic and delinquent problems if early efforts at improving their social relationships with peers and parents could be successful. In fact, the results of the intervention study described in this thesis endorse this positive message.