

# Family Risk Factors:

The Role of Cumulative Risk and Individual Risk Factors in  
Young Children's Social and Cognitive Development

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### **Abstract**

**Title:** Family Risk Factors: The Role of Cumulative Risk and Individual Risk Factors in Young Children's Social and Cognitive Development

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**Background:** Family risk factors are important in multiple aspects of children's development. Previous research in the field has mostly focused on populations with generally high levels of risk. Little is known about the occurrence and operation of family risk factors in low-risk populations, nor whether family risk factors are associated with developmental outcomes in similar ways in low- and high-risk populations. Finally, varying approaches to the measure of family risk are in use, and little is known about their implications.

**Method:** The current study used data collected in the Matter of the First Friendship (MOFF) study. Parental report was used to identify risk factors, and child interviews were used for outcomes. Measure of risk preceded measure of outcomes by one year. Data from 579 parental questionnaires and 487 child interviews were included. In a cross-sectional design, associations between family risk and four outcomes were investigated. Two approaches to family risk factors were selected, cumulative and individual factor approaches. The social and cognitive outcomes included children's Theory of Mind, digit span performance, whether they had a best friend, and social expectations in an ambiguous situation.

**Results:** Family risk factors were associated with developmental outcomes in both cumulative and specific ways. Theory of mind was associated with cumulative risk only. Digit span was associated with both cumulative risk and some individual risk factors. Whether the children reported having a best friend, and their social expectations, were not associated with cumulative risk, only with individual factors.

**Conclusion:** Both cumulative and individual factor approaches are necessary in research on family risk. Findings concerning the relative importance of these approaches are likely to depend on the level of aggregation of the outcome measures employed.

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## **Introduction**

Traditional views of human development saw it as a maturational time-dependent process. It was often conceptualized as occurring in qualitatively different stages, through which the individual progressed in a particular sequence (Lerner, 2002). Environmental influences on development in such perspectives were often seen as the environment having a one-way influence on the individual, affecting the speed with which the individual would pass through the developmental stages. Bell (1968) contributed to changing the latter perception, showing that developing children also affect their parents and general environment.

Today human development is usually understood as a process that works simultaneously on many levels and cannot easily be divided into qualitatively different phases. According to Rutter and Sroufe (2000), human development can be understood as "a progressive transformation and reorganization of behavior as the developing organism continually transacts with the environment" (p. 271-272). Views of this kind are dominant in the field (Cicchetti, 1989; Cicchetti & Curtis, 2007; Sameroff & Mackenzie, 2003), emphasizing the role of these transactions in shaping the development of behavior. The transactions occur on several levels, with the individual's constitution, genetic makeup, and environmental conditions interacting simultaneously over time.

Sameroff (2000) emphasizes the adaptiveness of human development. The individual's continual transaction with the environment has adaptation as its goal, implying that the process of development involves adjusting the individual's genetic makeup to function in a given environmental context. This view is also emphasized in clinical psychology, where symptoms and diagnosable disturbances are often viewed as adaptations to inadequate environments, which then turn out to be harmful over time (Axelsen, 1997).

A view of development as involving continual transactions also involves the possibility that difficulties can have their origin at any time of life, as well as the idea that previous experiences shape and influence later experiences (Rutter & Sroufe, 2000). This further implies that the earlier the experience, the larger its potential impact on the totality of an individual's development. Previous studies have shown that early experiences are of vital importance in human development (Rutter, Champion, Quinton, Maughan, & Pickles, 1995; see also Appleyard, Egeland, van Dulmen, & Sroufe, 2005; Rutter, 2005c; Rutter, Kim-Cohen, & Maughan, 2006). Knowledge about how conditions in children's first years affect

their later development is thus vital in both an individual, clinical perspective as well as in an epidemiological perspective. This especially concerns negative environmental influences and mechanisms that have the potential to ameliorate them.

Conditions affecting development in certain ways are often termed developmental *risk* (Cole, Cole, & Lightfoot, 2005). The origins of developmental risk may be genetic or environmental, but more often than not both genetic and environmental conditions will be affecting outcomes (Rutter, 2006; Rutter & Sroufe, 2000). Genetic factors and their expressions can often be difficult to modify. Environmental conditions affecting children's development are more easily modifiable in interventions. Establishing how environmental conditions affect development could contribute to the design of effective interventions for use in early childhood. Such interventions could have the potential to decrease rates of psychiatric and other mental difficulties in later life.

The purpose of the current study is to investigate the role of family risk factors in young children's social and cognitive development. This will be done by exploring if it is possible to find associations between conditions frequently identified as family risk factors and developmental outcomes in preschool age children. Children's Theory of Mind abilities, their own assessments of their closest friendships, their social expectations based on their abilities of social reasoning, as well as cognitive abilities like attention and working memory will be investigated for possible effects of family characteristics. It will further be explored whether associations between risk and outcomes work in cumulative ways, i.e. if it is the number of risk factors present that matter, or if such associations can be better explained by individual risk factors influencing outcomes in more specific ways. Findings could have implications for research on risk factors in general, but also concerning interventions.

### ***Conceptualizing Developmental Risk***

Developmental risk is a concept that has been widely applied in the field of developmental psychopathology. The traditional focus of this field has been the study of high-risk and deviant populations (Cicchetti, 1989). A host of studies have been carried out to identify factors that put individuals at risk for certain outcomes, typically psychiatric diagnoses. In recent years this focus has changed, and now the concept of risk is also employed in studies of how various conditions are associated with the development of individual differences within

non-clinical populations (Rutter, 2005c). This change came about due in large part to the realization that there is no clear-cut categorical difference between development in the normal range and pathologic development (Rutter, 2005c). According to this view, the same developmental processes lead to normality and pathology. Hence, developmental risk is important in all human development and identification of environmental conditions having a negative influence on child development will be vital to the understanding of the development of all children.

Kraemer, Lowe, and Kupfer (2005) define developmental risk as "the probability of an outcome within a population" (p. 5). This definition has three important features: (a) It implies that risk is probability; (b) it implies that researchers measure risk in a specified population; and (c) it implies that researchers measure risk for a specified outcome.

Risk being probabilistic implies that measures of risk convey how likely someone is to have a certain outcome. Data on risk always concern likelihoods and cannot be interpreted in deterministic ways. This also implies that risk can be modified by intervention.

Another feature of Kraemer and colleagues' definition (Kraemer et al., 2005) is that risk is measured and reported concerning a well-specified population. Data on risk cannot be generalized to populations other than the one under study, because conditions of risk and their effects are likely to vary considerably between different populations. Furthermore, data on risk are group level data, which means they cannot be directly generalized to individuals in the population.

Finally, risk is measured in relation to a specified outcome. The same genetic or environmental conditions may influence various developmental outcomes in different ways. Research has suggested a certain generality of risk, as protective and risk processes have a lot in common for different disorders (Rutter et al., 2006). Such findings do not, however, exclude the possibility of the presence of subtle but essential differences in how risk affects outcomes. The latter point underlines the importance of always studying and discussing developmental risk concerning specified outcomes. In light of the transactional nature of human development, risk will be an ever-present and important factor in human development. Furthermore, identification of the specific conditions having negative influences is an important task in developmental research.

### ***Risk Factors***

A risk *factor* can be defined as a factor shown to be associated with and preceding a negative outcome within a population (Kraemer et al., 2005; Kraemer, Stice, Kazdin, Offord, & Kupfer, 2001). Much of what we know about risk factors today is based on studies investigating what has also been termed *risk indicators* (Rutter & Sroufe, 2000). To label something a risk factor, there is no need for such a factor to be involved in causing the outcome, there just needs to be an association.

It is possible for risk factors to be directly involved in causal processes, but other possible explanations of associations between risk factors and outcomes also exist. One possibility is that a risk factor causes both the outcome as well as predisposes individuals for other risk factors, and that such second-order risk factors in reality are unrelated to the outcome in spite of an observed association. Another possibility is that unknown conditions outside of our knowledge cause both the presence of the risk factor and the outcome. The fact that risk factors not only interact in additive ways but even in more complex ways further complicates the picture. This includes risk factors from different domains, genetic and environmental alike (Kendler, 1996; Kraemer et al., 2001; Rutter, 2006, 2007a; Rutter & Sroufe, 2000). For these reasons, it is likely that searching for parsimonious and easily interpretable causal chains in this field will have us searching in vain.

Several researchers have encouraged research in the field to move beyond the mere identification of risk factors and rather focus on the mechanisms and processes through which risk factors influence development (Cicchetti, 1989; O'Connor & Rutter, 1996; Rutter, 2005c; Sameroff, 2000). To do this, there is a need to pull apart some of the approaches currently being employed to the study of developmental risk.

### ***Family Risk***

#### *The Ecology of Development*

The idea behind research on family risk is that variations in home environment and family characteristics differentially influence children's development, leading to variations in developmental outcomes. The concept of environment is not as straightforward as it may seem at first glance. In his ecologic model of human development, Bronfenbrenner (1979)



conceptualized the environment as consisting of four main levels, each interacting with both the other levels as well as the individual. These four levels of environment range from the most immediate - the child's microsystems, involving the main arenas of the child's daily life - to the most remote - the macrosystem.

How these levels impinge on the individual's development, and how they interact with the individual's genetic makeup, was further elaborated by Bronfenbrenner and Ceci (1994) in their bioecological model. The macrosystem, for instance, is considered to exert its main influence on child development through its influence on the more immediate levels of environment, i.e. dominant ideologies and cultural beliefs about child rearing are likely to influence the individual child's development by contributing to shaping the individual's more immediate surroundings, both at home and elsewhere. The family and home situation is conceptualized as one of the microsystems, an arena for what these researchers call *proximal processes*. These involve a "progressively more complex reciprocal interaction between an active, evolving biopsychological human organism and the persons, objects, and symbols in its immediate environment" (Bronfenbrenner & Ceci, 1994, p. 572). Such interactions are thought to necessarily extend over long periods of time in order to have substantial impact on child development. Bronfenbrenner and Ceci further consider properties of these processes to vary according to the characteristics of the developing person, the environment, as well as what kind of developmental outcome is under consideration.

Aspects of the environment are likely to make substantial contributions to the transactional processes involved in development (Zeanah, Boris, & Larrieu, 1997). Identifying the variations in home and family characteristics influencing child development is therefore important, even if such factors alone cannot account for the developmental processes involving individual children. In line with the ecological model of development, families, like individuals, cannot be studied in isolation from their context. For instance, it has been established in numerous contexts that having a single parent constitutes a risk factor in children's development (Candelaria, O'Connell, & Teti, 2007; Côté, Borge, Geoffroy, Rutter, & Tremblay, 2008; Gutman, Sameroff, & Cole, 2003; Sameroff, 1998). The impact of this risk factor will depend on a host of contextual variables, ranging from the general view of single parents in society, governmental support systems, as well as the availability and quality of day care, and the social network and economy of the single parent. This example shows that even if a risk factor largely influences development in the same way across different contexts, its

impact will always be influenced by contextual properties. In spite of such variation, there are some family characteristics that have been consistently found to negatively influence children's development in varying contexts. Examples of such family risk factors will be described in the next section, as an exhaustive review is beyond the scope of this paper. For a more thorough review, see Jenkins (2008; see also Sameroff, 1998; Zeanah et al., 1997).

### *Family Risk Factors*

The presence of psychological or psychiatric symptomatology in parents is one factor previously shown to be negatively associated with developmental outcomes in offspring (Stein, Ramchandani, & Murray, 2008; see also Côté et al., 2008; Sameroff, 1998; Zeanah et al., 1997). It has been maintained that developmental risk is not related to the specific kind of symptoms present, but rather to the severity and chronicity of such difficulties (Sameroff, 2000).

Socioeconomic status (SES) is another factor found to be associated with developmental outcomes in numerous studies (Appleyard et al., 2005; Geoffroy et al., 2007; Jenkins, 2008; Liaw & Brooks-Gunn, 1994) as has family communication and functioning (Appleyard et al., 2005; Borge, Rutter, Côté, & Tremblay, 2004) and how many people are currently living in the household (Gutman, Sameroff, & Eccles, 2002; Sameroff, Seifer, Barocas, Zax, & Greenspan, 1987).

### *Challenges in Family Risk Research*

One challenge in the study of family risk factors is that the impact of such factors, even within the same family, is unlikely to be static over time. Their mere occurrence may be relatively static, for instance if parents are divorced or not. Development occurring within a context of continual transaction, however, implies that both the severity of individual risk factors and their impact on families will be changing constantly. The impact of having a single parent will, for instance, vary with contextual factors as well as constitutional factors of the individual child (Lengua, 2002). It is possible that having a single parent will carry larger amounts of developmental risk for a child with behavior problems than for a child without such problems, because the parent is likely to have less available time for managing the child's behavior.

A transactional understanding of child development also entails that the amount of risk in a given household is likely to impinge differently on siblings growing up there (O'Connor & Rutter, 1996; Rutter et al., 1995). People choose different environments based on their genes and their previous experiences (Lengua, 2002; Rutter, 2006, 2007a). Genes and previous experience will also influence how people subjectively interpret a situation or experience. A huge potential for variation between individuals in the risk loading resulting from superficially similar experiences is therefore possible.

Another challenge in the study of family risk factors is how early one can expect to find detectable individual differences associated with such factors, and doubts have been expressed concerning whether such findings are possible early in childhood (Lerner, 2002). Effects of early risk being detectable only later has been referred to as sleeper effects (Lerner, 2002). However, recent studies suggest that effects of family risk are detectable already in infants (Candelaria et al., 2006) and toddlers (Skovgaard et al. 2007, 2008).

There seems to be a general view in much of the literature that statistical effect sizes are a potential measure of the clinical significance of an association (Kraemer et al., 1999, 2005). While this may be correct in much clinical and applied research, smaller effect sizes may still be of importance in research on environmental risk and its effects in young children's development. According to the *orthogenetic principle*, formulated by Heinz Werner fifty years ago (Werner, 1957), "whenever development occurs it proceeds from a state of relative globality and lack of differentiation to a state of increasing differentiation, articulation, and hierarchic integration" (p. 126). This implies that miniscule individual differences in small children may develop into larger individual differences of clinical importance in older children, adolescents, and adults. In line with this, Rutter (2005c) claims that variations within the normal range of symptomatology have been shown to predict later individual differences in the clinical range. Detection of individual differences that seem of little significance in small children may, in conclusion, be important because of the possibility of these developing into clinically significant differences at later stages of development. This is underlined by a study finding that risk factors influencing development in early childhood still seemed to have a significant impact on development well into adolescence, even when controlling for the risk factors present in middle childhood (Appleyard et al., 2005). There are also findings suggesting that early risk exposure increases the likelihood for later risk exposure (Rutter et

al., 1995), further underlining the need to not only rely on statistical effect sizes for judgments regarding clinical significance.

### *The Importance of the Family*

A final issue in research on family risk is the question regarding the family's real importance in children's development. Some researchers have claimed that arenas outside the home are far more decisive in the development of individual differences than the children's families (Harris, 1995, 1998). Several studies have for instance suggested variation in developmental risk connected to what kind of childcare arrangement children are attending (National Institute of Child Health and Human Development Early Child Care Research Network, 2003; Vandell & Corasantini, 1990).

A further examination of findings concerning child care reveals that family risk factors are an important moderator of the effects of non-maternal day care (Borge et al., 2004; Côté et al., 2007, 2008; Geoffroy et al., 2007). Children's adjustment to childcare in two studies was better predicted by parental characteristics than by any properties of the care in question (Belsky et al., 2007; Phillips, McCartney, & Scarr, 1987). In this way, family characteristics seem to influence child development in both direct and indirect ways. In conclusion, other arenas in children's lives may influence their development but they do not seem to be of the same importance as the family (Rutter, 2005c).

So far we have seen that many conditions related to family functioning, family demographics, parental characteristics, and characteristics of households in general have been found to carry varying amounts of developmental risk. These risk factors seem to be influencing development through a variety of levels of environment. Findings further indicate that family risk factors are important in multiple aspects of children's social and cognitive development. The next section will look at some of these associations.

## ***Family Risk in Children's Social and Cognitive Development***

### *Cognitive Development*

Studies investigating the relationship between family risk and cognitive development have often employed measures of IQ to operationalize cognitive development. Although there

should be little doubt that that family risk transacts with genetic and other constitutional factors in children's cognitive development (Gutman et al., 2003; Rutter, 2006), some of these studies have found substantial associations between family risk and children's IQ scores (Gutman et al., 2002; Liaw & Brooks-Gunn, 1994; Seifer et al., 1992). Similar findings have been done with infants (Candelaria et al., 2006). A longitudinal study (Gutman et al., 2003) found that children's academic development over time was significantly associated with environmental and family risk factors. Another study (Pike, Iervolino, Eley, Price, & Plomin, 2006) found associations between family risk factors and parental reports of children's cognitive functioning. These findings suggest that family risk factors have important influences on children's cognitive development. The conclusion from many of these studies is that the more risk that is present, the worse will be the children's outcome on measures of cognitive functioning.

### *Social Development*

In contrast to research on cognitive development, research on social development has no widely accepted outcome measures and thus seems to be more diverse. Social development constitutes many different aspects and abilities, and it is possible that this complexity is what we see reflected in the variation of outcome measures applied in this research.

Both parental and teacher report of children's social skills and social relationships have been found to be related to family risk (Phillips et al., 1987; Seifer et al., 1992). Theory of Mind (ToM) is an important skill facilitating social development. Measures of ToM may therefore be a good indicator of children's social development. Findings also suggest an influence of family characteristics on the development of ToM (Cutting & Dunn, 1999; Dunn, Brown, Slomkowski, Tesla, & Youngblade, 1991; Pons, de Rosnay, Harris, & Lecce, 2009).

Understanding emotions and being able to decode affective information from other people's behavior and facial expressions is important for children to be able to build lasting relationships with peers (Barth & Bastiani, 1997; Denham et al., 2002; Findlay, Girardi, & Coplan, 2006; Ginsburg et al., 2003; Keane & Parrish, 1992; Orobio de Castro, Merk, Koops, Veerman, & Bosch, 2005). Development of such skills seems to be connected to socialization practices in the home environment (Denham, Zoller, & Couchoud, 1994; de Rosnay, Pons, Harris, & Morrell, 2004; Pons et al., 2009). A study by Dunn (1995) further underlines the importance of these findings, showing that children's early emotion understanding was related

to their later perceptions of peer experiences, as well as their ability to grasp more complex emotional concepts at a later age. Social adjustment in early childhood also seems to be connected to social adjustment in adolescence (Pedersen, Vitaro, Barker, & Borge, 2007), implying that early social adjustment is important with regard to later social development.

One study found that certain kinds of family characteristics were associated with various kinds of bias in children's emotion processing (Schultz, Izard, & Ackerman, 2000). This finding implies that certain properties of the home environment have the potential to make children more likely to perceive anger in others, even outside the home situation. Other studies have established that such biases make children more likely to respond to their peers in aggressive ways (Orobio de Castro et al., 2005; Orobio de Castro, Slot, Bosch, Koops, & Veerman, 2003; Schultz et al., 2000). The latter effect seems to be more pronounced for boys than for girls (Schultz et al., 2000). Findings of variation between boys and girls are indeed common in studies concerning children's social development (Barth & Bastiani, 1997; Carlo, Knight, Eisenberg, & Rotenberg, 1991; Denham et al., 2002, 1994; Schultz et al., 2000).

Studies focusing on behavioral problems have found associations with family risk factors for children between the ages of five and seven (Ackerman, Kogos, Youngstrom, Schoff, & Izard, 1999; Ackerman, Schoff, Levinson, Youngstrom, & Izard, 1999; Kim-Cohen, Caspi, Rutter, Tomás, & Moffitt, 2006). Similar associations have been found for both slightly older (Borge & Melhuish, 1995; Deater-Deckard, Dodge, Bates, & Pettit, 1998), and slightly younger children (Liaw & Brooks-Gunn, 1994). Associations have also been found between family risk in early childhood and behavior problems in adolescence (Appleyard et al., 2005).

Hardly any studies investigating the relationship between family risk and social development have used children's own reports regarding their social relations. According to Crick and Dodge (1994; see also Lemerise & Arsenio, 2000), such reports may be just as valid measures of social development as parental or teacher reports. They concluded that there seems to be strong evidence of a relation between children's typical processing styles concerning social information and their social adjustment.

There seem to be strong indications that development of skills and other characteristics important in social development is related to properties of children's home environment. In research on risk factors and their effects, risk has been conceptualized and operationalized in a variety of ways. One central division is between studies focusing on the specific effects of

individual risk factors and studies focusing on the number of risk factors present in the family, often termed cumulative risk.

### ***Cumulative Risk Versus Individual Risk Factors***

#### *The Cumulative Approach*

The cumulative approach to the study of developmental risk gained momentum with Rutter's classic study (Rutter, 1979), showing that the number of present risk factors was related to the likelihood of 10-year-olds having a psychiatric diagnosis. It has later been employed in many studies concerning the effects of developmental risk. A study by Sameroff et al. (1987) used the cumulative approach to study effects of social-environmental risk factors on the IQ scores of 4-year-old children. Cumulative risk was found to be related to children's IQ scores, and the likelihood of such scores being lower increased progressively with the number of risk factors present. No individual risk factors were found to be related to IQ scores. These researchers thus concluded that the various risk factors could be considered interchangeable, and that it didn't matter what specific factors were present, only how many.

Studies have found associations between cumulative family risk and both early (Trentacosta et al., 2008) and later behavior problems (Appleyard et al., 2005), children's IQ scores and academic performances over time (Gutman et al., 2002, 2003), and physiological measures of stress in children (Evans, 2003; Evans, Kim, Ting, Tesher, & Shannies, 2007). In line with Rutter (1979), results from these studies suggest that cumulative risk works in an additive way, i.e. that as the number of present risk factors increases, so does the likelihood of negative developmental outcomes. Sameroff (1998) modified this view slightly, stating that individual risk factors may impinge on development, but that the most detrimental effects are caused by the presence of multiple risk factors. In other words, Sameroff did not exclude the possibility of finding associations between individual risk factors and developmental outcomes, but he claims such associations to be of relative unimportance.

#### *The Individual Risk Approach*

Few studies have investigated possible effects of individual risk factors. An important exception to this is a recent study (Pike et al., 2006) claiming that the amount of variation

accounted for by looking at individual risk factors, and their associations with developmental outcomes, far exceeds what will be found when the cumulative approach is employed. Their findings further indicated that some risk factors seem to work in a rather general manner. SES was, for instance, found to be related to both cognitive and behavioral measures. Some of the more proximal parenting measures were found to be more specifically related to behavior problems in the children. Since parental report was used to obtain information on both risk and outcome measures in this study, however, interpretations of its findings are limited. Using parental report is not a problem per se, but it is a problem that the same informant is used to obtain information on both risk variables and outcome variables under investigation in the same study because this may lead to possible dependency in data (O'Connor & Rutter, 1996; Rutter, 2007b; Rutter, Pickles, Murray, & Eaves, 2001).

### *Comparing the Approaches*

The studies discussed above have limitations in that they focused exclusively on either cumulative or individual factor approaches to environmental risk. There seems to be a lack of research comparing these two approaches. Instead, most of the studies in the field seem to be choosing one of them and attempting to make theoretical rationalizations for this choice. To make any kind of statement about the validity or usefulness of one of these approaches over the other, direct comparisons need to be made using the same sample and the same data set. For a proper comparison of this kind to be made, it will also be necessary to focus on multiple outcomes in various developmental domains in the same study. It is possible that the two approaches are of different value in different developmental domains. Focusing on multiple outcomes simultaneously will help us avoid making rash conclusions about the general usefulness of the respective approaches, based on their usefulness concerning a single outcome measure.

Even if there is a lack of studies directly comparing the two approaches, some previous studies have used both approaches. This allows for interpretations regarding the viability of the respective approaches. One study (Liaw & Brooks-Gunn, 1994) found IQ scores to be related to cumulative risk, as well as a tendency of such scores to decrease as the number of risk factors increased. This is in line with some previously mentioned studies (Gutman et al., 2002, 2003; Sameroff et al., 1987). Behavior problems, on the other hand, seemed to have more specific relations with individual risk factors and did not change as a function of the



number of present risk factors. The study by Liaw and Brooks-Gunn did not focus on family and environmental risk only. It also included measures of biological risk, possibly making its conclusions less relevant in a discussion focusing exclusively on family risk. Further, the study was conducted using only low birthweight, premature infants. The generalizability of these findings thus remains limited.

A related approach was chosen in a study featuring a small sample consisting only of high-risk individuals (Ackerman, Schoff, et al., 1999). Only children from economically disadvantaged families were included and only parental and teacher reports were used for the outcome measures. Findings suggested that the cumulative approach to developmental risk predicted externalizing behaviors in children, but not internalizing problems. The researchers then made smaller indices, representing clusters of a few risk factors each. They were subsequently able to differentially predict both externalizing and internalizing problems. Possible specific effects of individual risk factors were not investigated by this study, but the fact that predictions of child behavior were made more accurate by splitting the cumulative risk index into smaller clusters, is an indication that some of the observed effects may have been explained by specific associations between outcomes and individual risk factors. Furthermore, the study is of limited relevance to the current discussion because of its exclusive focus on behavioral difficulties as the outcome measure.

The study by Deater-Deckard et al. (1998) has similar limitations, as it only focused on externalizing behavior problems in children as an outcome measure. Data on both risk and outcomes were obtained through parental and teacher questionnaires. The study found associations with both cumulative risk and individual risk factors on these measures. Concerning a comparison of the two approaches, they concluded that "although the number of risks may be a more parsimonious model, individual differences in the presence or absence of particular risk factors remained vital to predicting externalizing behavior problems" (p. 488-489). In other words, the cumulative risk approach may seem more straightforward and easier to interpret, but individual risk factors had specific associations with externalizing behavior problems that could not be overlooked.

A final study to draw conclusions concerning the two approaches included both of them in a comparison (Burchinal, Roberts, Hooper, & Zeisel, 2000). The study was conducted on a small sample of high-risk, ethnic minority children and only outcome measures connected to cognitive development were employed. Generalizations are therefore limited. One strength of

the study is that the outcome measures were obtained by a separate assessment of the children participating, not by parental report. The study also was longitudinal and children were assessed over time. The study found that individual risk variables considered together provided better predictions of developmental outcomes at a particular age, but cumulative approaches were more useful regarding the prediction of overall developmental patterns. Burchinal and her colleagues concluded that both individual risk factor and cumulative approaches were viable methods for relating social risk to developmental outcomes.

Few of the studies comparing cumulative approaches with individual factor approaches have focused on more than one or two outcome measures simultaneously. This opens up for the possibility that the observed associations are specific to the developmental domain of the outcome measure employed. It also limits interpretations regarding the general usefulness of the respective approaches. Most of these studies have included only high-risk individuals in their samples, further limiting the use of such interpretations. What they do seem to indicate is that there is support for both cumulative and individual factor approaches to the study of family risk. The relation between these two approaches still seems unclear. One possible relation between these approaches will be discussed next.

### *The Aggregation of Measures*

The concept of equifinality involves the idea that multiple developmental pathways may lead to the same developmental outcome (Cicchetti & Rogosh, 1996). In line with this idea, it is possible that findings concerning cumulative versus individual risk factor approaches will depend on the level of aggregation of outcome measures employed in the various studies. According to Sameroff (2000): "an ecological model [of development] emphasizes the contributions of multiple environmental variables at multiple levels of social organization to multiple domains of child development" (p. 307). It would, hence, be reasonable to suggest that cumulative risk, which is an aggregated measure of risk, is likely to be a better predictor of aggregated measures of behavior than of specific behavior in a specific setting. It further follows that specific risk factors will be better predictors of more specific behavior measures.

Findings supporting the cumulative approach to developmental risk have often employed such aggregate measures of behavior as outcome measures, like IQ or clinical diagnoses (see Gutman et al., 2002, 2003; Sameroff et al., 1987). There is a possibility that the lack of observed associations with individual risk factors in these studies is caused by the high level

of aggregation of outcome measures. This possibility is further underlined by the findings of Burchinal et al. (2000): cumulative risk was a better predictor of overall developmental patterns, while individual risk variables were better predictors of developmental outcomes at specific ages. Also Deater-Deckard et al. (1998) maintained that their findings were consistent with the idea of multiple developmental pathways leading to the same developmental outcome, making it possible that observed associations with cumulative risk in their study could be explained by the level of behavioral aggregation in the outcome measures.

Researchers in the field of developmental risk have been urged to move beyond simple, linear models of developmental risk to investigate the processes and mechanisms through which risk factors impinge on development (Rutter, 1994, 2007b; Sameroff, 2000). One possible way of moving in this direction may be to increase the focus on both specific effects of individual risk factors as well as how they relate to each other. Further investigations in this direction, however, requires that the field in general moves beyond the exclusive focus on cumulative risk which seems to have been predominant in the previous decades.

### ***The Current Study***

Three research questions were chosen for the current study. It has been maintained that developmental risk is a universal phenomenon, and that it affects development in all kinds of populations (Rutter, 2005c). Most of the studies to date have been conducted in populations with generally high levels of risk. The first of the research questions is thus what kind of family risk factors and what level of them can be found in an assumed low-risk population. The population from which the current sample was drawn can be assumed to be low in risk for several reasons. Foremost, Norway in general has low incidence of many of the social conditions typically found to be negatively related to child development (Statistics Norway, 2008a). The current sample was further drawn from a geographic area with few social problems, even when compared to other parts of the country (Statistics Norway, 2008a; Tønseth, 1999). Incomes were generally around the national median (Statistics Norway, 2001), but living costs are lower and the number of people in the area living beneath the poverty line is also lower than in more urban parts of Norway (Mogstad, 2005).

It has further been claimed that risk influences development in quite general ways, and that findings can to some degree be thought to concern human development in general

(Kraemer et al., 2005; Rutter, 2005c). It thus becomes a problem that most of the studies to date have been conducted in high-risk populations, because we cannot exclude the possibility of developmental risk working in qualitatively different ways in high- and low-risk populations. The second and third research questions were chosen to investigate this possibility by exploring how developmental outcomes are associated with measures of family risk in an assumed low-risk population. Both a cumulative and an individual risk factor approach were chosen for this investigation.

Two main reasons for choosing to focus on both cumulative and individual factor approaches were considered: (a) with generally low levels of risk assumed, it might be that effects are harder to detect. In turn, this implies the possibility of not finding any associations between risk and outcomes whatsoever. To exclude one possible confounding explanation, that an inadequate approach to operationalizing risk in the current sample had been chosen, it was decided to investigate the relationship between risk and developmental outcomes using both cumulative and individual factor approaches. (b) The use of both of these approaches in the same study could provide a basis for further exploration of the relationship between them.

The fact that the current study was conducted in an assumed low-risk sample makes it quite distinct from previous research in the field. It may be that the general levels of affluence in the current sample also involves presence of resilience and protective processes, which could ameliorate the effects of risk factors and therefore make such effects seem qualitatively different to findings from previous research (Borge, 2003; Rutter et al., 2001).

Liaw and Brooks-Gunn (1994) suggested that low income accounted for so much variance in children's outcomes in their sample that other factors mattered very little in low-income families. When the sample is relatively affluent it is possible that other risk factors gain more importance than income and other SES-related variables. This further suggests that studies conducted using more affluent samples, like the current one, may help us to pull apart effects that are also present to a smaller degree in low-income samples, but are not detectable there because they are overshadowed by the effects of SES.

Another property of the current study separating it from previous research is that the sample consists of younger children than is often the case. This may lead to associations being harder to detect and not as clearly significant as findings in previous research. Considering the above discussion of the orthogenetic principle, however, findings that are seemingly weaker in the study of younger children do not exclude such findings from being clinically

meaningful. Further, the current study used children's own reports, test performances, and expectations based on their social reasoning as outcome measures. This is a considerable strength compared to previous studies using the same informant to obtain data on both risk and outcome measures.

Finally, the current study will not be treating SES as a single entity in the analyses. It will attempt to pull apart some of the different aspects of SES, such as income, education and employment status of mothers and fathers respectively. Kraemer et al. (2001) encouraged this, because it is possible that the ways in which SES operates differs with the developmental domain or developmental phase under study, as well as with contextual factors like time and place. Designing effective intervention strategies requires specific knowledge about what aspects of SES should be the target of intervention in a given population.

All children in the current study attended Norwegian day care centers. For simplicity, these are referred to as *kindergartens*. Norwegian kindergartens offer services for children from about one to six years of age. Government regulations require at least one child care worker per five children, and one preschool teacher per 14-18 children for children older than three (Kunnskapsdepartementet, 2005a, 2005b). For younger children, regulations require more staff.

In sum, three research questions were chosen: the first one concerns the occurrence of risk factors in an assumed low-risk population, while the second and third concern the two discussed approaches to developmental risk.

1. What kind of family risk factors and what level of them can be found in an assumed low-risk, semi-rural, Norwegian sample of children between the ages of two and seven?

2. Is it possible to find associations between cumulative family risk and measures of young children's social and cognitive development?

3. Is it possible to find associations between individual risk factors and measures of young children's social and cognitive development?

## **Method**

The current study uses data collected in the Matter of the First Friendship (MOFF) study. MOFF is a longitudinal study whose initial objective was to investigate the importance of

early friendships in children's development. MOFF was designed in 2005 and data collection started in 2006. It has received approval from the Norwegian Regional Ethics Committee and the Norwegian Data Inspectorate.

### ***Participants***

Participants were recruited through kindergartens in two semi-rural neighboring municipalities located in eastern Norway, between one and two hours' drive from the capital. More than half the workforce in these municipalities commute to the capital on a regular basis. Living costs are lower than in the capital. As of 2009, the two municipalities have respective populations of 13217 and 8552 (Statistics Norway, 2009). They are semi-rural with farming areas, rural dwellings, and a few small towns.

There are 32 kindergartens in the municipalities, all of which participated in recruiting families for the study. These kindergartens represent the whole spectrum of kindergartens available in Norway; privately or publicly owned, ranging in size from 4-8 children to over 100 children.

Parents received written information about the project and those wanting to participate gave their written consent. This involved consenting to answer questionnaires, giving permission for the child to be interviewed, and allowing preschool teachers to assess the children. Parents were informed that the study would be longitudinal with procedures being repeated four times at one-year intervals.

Of all children in the municipalities, 95% of five- and six-year-olds attended kindergarten. Also an overwhelming majority of the four-year-olds (80%) did, but the percentage was smaller for three- (50%) and two-year-olds (30%). Parents of all 905 eligible children were invited, and 64% consented. It is possible that some families may have had more than one child in the sample. It is not known how many families this concerns, as it was not controlled for during sampling procedures.

The sample in the current study consisted of 579 children and their parents. Of these children, 306 were girls and 273 boys. Mean age of the participating children at the time of the first data collection was 52 months ( $SD = 16$ ), and 64 months ( $SD = 16$ ) at the second. All 579 parents returned the questionnaire from the first data collection, while 487 children participated in the interview during the second data collection.

### ***Procedures***

The data in the current study was obtained from the parental questionnaire used in the first data collection of the MOFF study and the child interview carried out during the second data collection. The first data collection preceded the second by one year.

The questionnaires completed by parents was administered by the kindergartens and then sent to or picked up by the project manager.

The interviews with the children were conducted by specially trained interviewers who traveled around to the different kindergartens and interviewed each child individually. Preschool teachers from other kindergartens performed the interviews, to avoid the children being interviewed by someone they already knew. Before the interviews, the interviewers came to visit the kindergarten so the children would recognize them on subsequent visits. The interviews were carried out in a separate room, were incorporated into the daily rhythm of the kindergarten, and lasted for about twenty minutes.

### ***Risk Variables***

Information on all risk variables in the study was obtained through the parental questionnaire.

#### ***Family Status***

Parents were asked whether they had a partner and whether they had a formalized relationship. The various answers were collapsed into a dichotomous variable with married and cohabiting parents receiving a score of 0, while parents reporting to be separated, divorced, widowed, or single received a score of 1.

#### ***Family Functioning***

Family functioning was measured using a scale originally developed for the Ontario study (Boyle et al. 1987; Offord et al. 1987). The scale consisted of 13 items that the parents rated on a 4-point scale, from *completely agree* to *completely disagree*. The items focused on interpersonal support, conflict resolution, and the emotional climate in the family, i.e. "We show our feelings and care about each other". After reversing the appropriate scores, scores on the items were summed to form a score of family functioning between 13 and 52, where a

score of 13 would indicate no problems in family functioning. The internal consistency of the scale (13 items,  $\alpha = 0.85$ ) can be considered adequate (Pedhazur & Schmelkin, 1991).

#### *Psychological Health of the Caregiver*

This variable was measured using a short version of the Symptom Check List (SCL). It has been argued that a five-item short version of the SCL can be adequate as a crude measure of global mental health (Tambs & Moum, 1993). This short form was later expanded with three items (Fink et al., 1995), making a short version of the SCL constituting eight items focusing on symptoms of anxiety and depression. In the current study, these eight items were rated by parents on a 4-point scale according to how much they were bothered by these symptoms, from 1 (*not a problem*) to 4 (*very much a problem*). The scores were summed into a measure of psychological symptom load ranging from 8 to 24. The internal consistency of this scale (8 items,  $\alpha = 0.83$ ) can be considered adequate (Pedhazur & Schmelkin, 1991).

#### *Use of Alcohol in the Household*

Three different measures of alcohol use in the household were employed: (a) frequency of drinking was measured on a 7-point scale, ranging from 1 (*never*) to 7 (*about 6-7 times a week*); (b) amount of alcohol consumed in each instance of drinking was measured on a 6-point scale, ranging from 1 (*less than one unit*) to 6 (*10 or more units*); (c) agreement to the statement "Drinking is a source of tension and disagreement in our family" was rated on a 4-point-scale from *completely agree* to *completely disagree*. For the latter measure, answers were collapsed into a dichotomous variable for the purpose of analysis giving *completely agree/agree* a score of 1 and *completely disagree/disagree* a score of 0.

#### *The Parents' Level of Education, Income and Status of Employment*

Both maternal and paternal level of education were separately measured on 7-point scales, from 1 (*completed secondary school*) to 7 (*university/college, more than four years*). Maternal and paternal income were similarly measured on 6-point scales from 1 (*no income*) to 6 (*more than 500.000 NOK*). Employment statuses were reported as dichotomous variables, answering the question "Is the mother/father in education and/or paid work these days?". A negative answer to this question gave participants a score of 1 on this variable.



### *Other Risk Variables*

Maternal age at birth was obtained by subtracting the child's age from the mother's and ranged from 17 to 46 years. Number of siblings in the household was reported as a separate question and ranged from 1 to 10.

### ***The Cumulative Risk Index***

#### *Considerations*

A cumulative risk index was created to measure the number of risk factors present in the families. To create such an index, risk variables need to be categorized as either *present* or *not present* (Sameroff, 1998). This necessarily involves dichotomization of risk variables that were measured using continuous scales (Côté et al., 2008; Deater-Deckard et al., 1998; Evans, 2003; Sameroff, 1998). Such dichotomization is problematic for a number of reasons. Above all, it leads to loss of variation in the variable under study, which again can result in loss of information about individual differences, reduction of effect sizes, and loss of statistical significance (MacCallum, Zhang, Preacher, & Rucker, 2002; Pedhazur & Schmelkin, 1991).

MacCallum and colleagues (2002) showed that dichotomization can sometimes produce spurious effects, especially when two or more predictor variables in the same analysis are dichotomized. They also pointed out that dichotomization may lead to a lack of comparability of measures and results across studies. This is especially a concern when quartiles or thirds are used as cutoff values to define groups as high or low in risk, which is a procedure commonly employed in research on family risk (Borge et al., 2004; MacCallum et al., 2002). The distribution of variables may differ considerably between samples, and this may lead to considerable variation in cutoff values between studies. Such variation makes studies focusing on the same risk variables difficult to compare, because what is considered high or low risk will depend on the variation in the specific sample being studied (MacCallum et al., 2002).

Other researchers (Farrington & Loeber, 2000) claim that dichotomization is useful, especially when focusing on individuals with multiple risk factors. They maintain that because family and other environmental risk factors are often interrelated, dichotomization can make data more easily interpretable and genuine associations easier to identify. It further encourages the identification of individuals who are particularly vulnerable due to presence of

multiple risk factors. Furthermore, dichotomization also facilitates detection of nonlinear relationships, which is useful because family risk variables are not always normally distributed. Finally, dichotomization is necessary to create an intelligible index measuring the number of risk factors present. Because of the problems involved in the creation of such an index, however, analyses including it must be interpreted with caution.

### *Creating the Cumulative Risk Index*

The cumulative risk index was created by dichotomizing all risk variables and summing how many were present. Measures of 12 variables were used, resulting in a potential score on the risk index between 0 at the lowest and 12 at the maximum. If a score on a risk variable was missing, it was considered *not present* and a score of 0 was allocated.

Some variables were dichotomous from the outset and were used as they were. This applied to mother's employment status, father's employment status, and family status. The rest of the variables were dichotomized in a variety of ways, considering both matters of face validity and how they had been dichotomized in previous research.

Maternal age at birth was dichotomized using the cutoff of a recent study (Côté et al., 2008). Participants whose mothers were 20 years or younger at birth received a score of 1, while participants whose mothers were 21 years or older at birth received a score of 0.

The number of siblings in the household was also dichotomized according to procedures in previous studies (Seifer et al., 1992; Gutman et al., 2003). Participants living in a household with a total of four or more siblings were assigned a score of 1, while participants living in a household with a total of three siblings or less were assigned a score of 0.

Use of alcohol in the family was dichotomized using a combination of the three variables measuring alcohol consumption and its implications in the family. If the parent either (a) reported drinking alcohol 2-3 times a week or more often; (b) reported drinking 5-6 units or more of alcohol in each instance; or (c) agreed that alcohol was a source of tension and disagreement in their home, a score of 1 was assigned to the participant. Either of these three variables can be considered separate indications of harmful alcohol use, and are in line with conceptualizations of heavy drinking and harmful use of alcohol employed in epidemiological research (Day & Homish, 2002).

Maternal and paternal education were dichotomized according to whether the parents had graduated from upper secondary school, which is roughly equivalent to high school. This

cutoff is in line with previous research (Candelaria et al., 2007; Côté et al., 2007; Liaw & Brooks-Gunn, 1994; Seifer et al., 1992).

The remaining risk variables (maternal and paternal income, family functioning, psychological health) were dichotomized using quartiles or the cutoff being closest to the relevant quartile. In the case of maternal income, for instance, 37.3% of the sample was included in the high-risk (lowest quartile) group. The procedure also involved different cutoffs for maternal and paternal income, as these variables had different distributions.

Six of the twelve variables included in the index measure circumstances connected to SES. These were the mothers' and fathers' education levels, incomes and employment statuses. Including all of these variables may involve giving SES too much weight in the index, compared to its actual impact among all existing family risk variables. In previous studies it has not been uncommon to include several measures connected to SES in the same index (Burchinal et al., 2000; Côté et al., 2008). Findings from previous research accentuates the importance of the number of present risk factor (Sameroff, 1998), and all six measures can be considered as separate risk factors (Kraemer et al., 2001). The purpose of the index is furthermore to address issues of cumulative risk, and entering the SES factors into the index in any kind of clustered form may obscure the picture and make results more difficult to interpret. To avoid too many aggregate measures in the risk index and further loss of variation in data, the six SES variables were included in the risk index separately. A final point in this discussion is that the measures of SES in the current study were not highly correlated (see Appendix A). These intercorrelations can be considered moderate at best (Hinkle, Wiersma, & Jurs, 2003; Pallant, 2001).

### ***Child Characteristics***

Information about the child's age, sex, and expressive language level was obtained from the parental questionnaire. Age was reported in months and used as a continuous variable. For sex of the child girls were given a score of 1 and boys a score of 2.

Expressive language level was measured on a 6-point scale of increasing grammatical complexity, ranging from 1 (*not yet talking*), to 6 (*talking in long and complicated sentences*) (Dale, Price, Bishop & Plomin, 2003).

## ***Outcome Variables***

### *Theory of Mind*

Two assignments aiming to measure Theory of Mind (ToM) were given in the interview with the children. The first involved the children being shown a milk carton and a wallet and asked where they thought there would be money. Money was then taken out of the wallet and put in the milk carton. This was done in front of the child. Finally, the child was asked where the next child to be interviewed would believe the money to be.

The second task was similar, but involved a candy box filled with drawing pins. The children were asked what the next child to be interviewed would believe the box to contain, after being shown that it contained drawing pins and not candy.

Correct answers were scored 1 and incorrect answers were scored 0. The scores from the two ToM tasks were then summed, giving each child a ToM score of 0, 1, or 2.

### *Digit Span*

The digit span task is included in several test batteries currently in use for assessment of general cognitive abilities, like the Wechsler scales (Lezak, Howieson, & Loring, 2004). Digit span constitutes two parts, termed digits forward and digits backward. During digits forward, digits were read to the children and they were asked to repeat them immediately. The interviewers read gradually more digits until the children no longer succeeded in repeating them all in the correct order. This test is considered to be a measure of the efficiency of attention processes (Lezak et al., 2004). In digits backward, administration is similar, but the children are asked to repeat the digits in reverse order. This is claimed to be a measure of working memory and related abilities (Lezak et al., 2004). Summing results from the two tasks gives a total digit span score.

This measure cannot be compared to a full cognitive assessment, but can be considered a crude measure of cognitive development and abilities, especially attention processes and working memory capacity. It should be noted that according to Lezak et al. (2004) these two abilities are not necessarily related, meaning that two identical total scores on digit span may be the result of hugely differing performances. However, digit span is easy to administer, no extra materials are needed, and it provides a crude measure of some basic cognitive capacities. For these reasons, it is a good option in studies like the current one, where a

comprehensive cognitive assessment of all participants would be too costly and time consuming.

### *Best Friend*

In the interview, the children were asked by the interviewer if they had a best friend. The answers were turned into a dichotomous variable and coded 1 if the children reported to have a best friend and 0 if the children reported not to have a best friend.

### *Social Expectations*

The social expectations task involved the presentation of a drawing featuring an ambiguous social situation accompanied by a short narration by the interviewer. The drawing featured a girl approaching two other girls who were playing together, the narration indicating that it was the approaching girl's first day at kindergarten/school and that she did not yet know any of the other children. The narration further explained that this girl sees the other girls playing and looking like they are having fun. She starts to approach them because she wants to join in and play. The participating children were then asked what the approaching girl was feeling, what the other girls were feeling, what would happen, and what the approaching girl would be feeling afterwards. For a more thorough description of this procedure, see the study by Eivers, Brendgen, and Borge (2009). The measure used in the current study was the children's answer to how the girl would be feeling afterwards, aiming to target children's expectations of the outcome of a social interaction.

Five different answers could be given by the children, that the girl would be feeling *happy*, *sad*, *angry*, *afraid*, as well as *I don't know*. These answers were collapsed into two dichotomous variables, one featuring positive emotions (happy) versus other possible answers (sad, angry, afraid, don't know), and the other featuring negative emotions (sad, angry, afraid) versus other possible answers (happy, don't know).

The reasons for choosing to turn these answers into two different dichotomous variables instead of one were both theoretical and practical. Answers containing positive and negative emotionality in these kinds of procedures might be qualitatively different and possibly only modestly related concepts (Oatley, Keltner, & Jenkins, 2006). Furthermore, excluding the children answering that they didn't know from the analysis may involve losing important information. Such an answer in this kind of procedure cannot simply be treated as noise. The

children providing it are given the opportunity to answer using both positive and negative emotions, but choose not to. Collapsing answers of the same question into two outcome variables may complicate the interpretation of the results, but it was considered the most theoretically sound solution. Even if social expectations were turned into two different variables, it was not possible to gain a score of 1 on both of them.

### ***Statistical Analyses***

All analyses were conducted using SPSS version 16.0. For investigation of the association between risk variables and the continuous outcome variables, ToM and digit span, linear regression analyses were employed. As part of these analyses the conditions for linearity of associations were examined and found to be acceptable. The data were also tested for multicollinearity, using both the collinearity diagnostics function of the linear regression program of SPSS, as well as running bivariate Pearson's correlation analyses on all risk and outcome variables measured (see Appendixes A and B). Because some of the risk and outcome variables violated assumptions of normality of distribution, Spearman's rank order correlation, a nonparametric test, was also performed. No differences were found, and only the results of the parametric tests are reported. Multicollinearity seemed not to be a problem, as intercorrelations between risk variables can be considered nonexistent to moderate (Hinkle et al., 2003; Pallant, 2001). For the dichotomous outcome variables, best friend and social expectations, binary logistic regression analyses were employed to investigate their relationship with risk variables.

In all regression analyses the child's sex, age in months, and language level were included as control variables. Separate analyses were performed on all outcomes for associations with both the cumulative risk index and all individual risk variables respectively. In the analyses featuring the individual risk variables, these were entered into the analyses as they were originally scored, i.e. not in their dichotomized form.

Missing data lead to cases being excluded listwise from analyses. This led to some analyses including little more than half the sample. It was chosen not to replace missing values with mean or median values due to the uncertainties of inferring what parents mean when they do not answer a question. Analyses of the missing values were performed, and some test analyses replacing missing values with means were also ran. Results of these

analyses indicate that the main picture of results are unlikely to have changed. Further, controlling for the presence of other known risk variables is vital when drawing conclusions about risk variables' associations with outcome measures (O'Connor & Rutter, 1996; Rutter et al., 2001). It was therefore chosen not to omit seemingly irrelevant risk variables from analyses in order to increase statistical power, because such an omission could make the results more difficult to interpret and weaken the generalizability of results.

Finally, analyses were performed to investigate whether children who had completed the interview differed from those who had not on measures of risk. These differences varied from negligible to nonexistent.

## **Results**

### ***Occurrence of Risk Variables***

The first issue under study was what kind and level of risk factors could be found in an assumed low-risk, semi-rural, Norwegian sample of children between the ages of two and seven. Data on all 579 families having returned the questionnaire was included.

The findings concerning the individual risk variables are summarized in table 1. Low maternal age at birth was not common in this sample. Mean age at birth was 29.3 years ( $SD = 4.3$ ), which is close to the national average (Statistics Norway, 2008b). Only 1.9% of children in the study had mother who gave birth at the age of 20 or earlier. An overwhelming majority (87.9%) of children had parents who were living together. Only 1.4% of children were living in a household with a total of four or more siblings.

It was somewhat more surprising that 14.7% of mothers and 16.6% of fathers had not completed upper secondary school, as well as 13.5% of mothers and 6.4% of fathers not being in paid work and/or education at the time of the first data collection. The latter is surprising since participants were recruited through kindergartens, which means the explanation cannot be that these parents were at home to take care of the children participating in the study. Still, it is possible that some of these parents were at home taking care of younger siblings of participating children, not yet enrolled into kindergarten.

Even though mothers on average reported achieving higher levels of education than fathers, they also reported on average lower incomes. This is further reflected in the finding

that mothers on average worked fewer hours per week ( $M = 30.6$ ,  $SD = 8.7$ ,  $n = 479$ ) than fathers ( $M = 39.7$ ,  $SD = 7.8$ ,  $n = 507$ ). Concerning alcohol use, 6.2% reported drinking alcohol twice a week or more, 8.3% reported typically drinking five units or more of alcohol in each instance, while 4.0% of parents reported drinking to be a source of tension or disagreement in the family.

Table 1

*The Level and Frequencies of Risk Variables Found in the Sample*

Risk variable	Mean	SD	Frequencies					
			Risk present		No risk		Missing	
			<i>n</i>	(%)	<i>n</i>	(%)	<i>n</i>	(%)
Mother's age at birth	29.3	4.3	11	(1.9)	470	(81.2)	98	(16.9)
Family status			62	(10.7)	509	(87.9)	8	(1.4)
Sibship size	1.5	0.9	8	(1.4)	554	(95.7)	17	(2.9)
Family functioning <sup>a</sup>	31.5	3.2	113	(19.5)	449	(77.5)	17	(2.9)
Psychological health of caregiver <sup>a</sup>	9.8	2.7	149	(25.7)	428	(73.9)	2	(0.3)
Frequency of drinking	2.5 <sup>c</sup>	1.2	36	(6.2)	536	(92.6)	7	(1.2)
Amount of alcohol	2.3 <sup>b</sup>	0.8	48	(8.3)	507	(87.6)	24	(4.1)
Drinking as a source of problems			23	(4.0)	534	(92.2)	22	(3.8)
Mother's education level	4.1 <sup>c</sup>	1.4	85	(14.7)	494	(85.3)	0	0
Father's education level	3.6 <sup>c</sup>	1.4	96	(16.6)	460	(79.4)	23	(4.0)
Mother's income <sup>a</sup>	2.9 <sup>b</sup>	1.0	212	(36.6)	356	(61.5)	11	(1.9)
Father's income <sup>a</sup>	4.2 <sup>b</sup>	1.1	150	(25.9)	402	(69.4)	27	(4.7)
Mother unemployed			78	(13.5)	499	(86.2)	2	(0.3)
Father unemployed			37	(6.4)	531	(91.7)	11	(1.9)

*Note.* Means and standard deviations are not given for variables that were reported by parents as dichotomous variables.

<sup>a</sup> This variable was split into risk/no risk by quartiles. <sup>b</sup> Scores on this variable was collected on a 6-point scale. <sup>c</sup> Scores on this variable was collected on a 7-point scale.



On family functioning the mean score was 31.5 (*SD* = 3.2) and scores varied between 13 and 40. This suggests that most families report some difficulties, but not many and not high levels. The low standard deviation is furthermore an indication that most families in the sample function on approximately the same level, and that there was little variation in the sample concerning family functioning. The latter point is further underlined by the high number of parents living together.

Scores concerning the psychological health of the caregiver fell in the whole range from 8 to 24. Mean score was 9.8, and this can be explained by many parents reporting to have no psychological symptoms (228 respondents, 39.4%).

The number of present risk variables in the families was calculated, and numbers are reported in table 2. Scores varied between 0 and 9 in the possible range from 0 to 12. Only 17.8% of families reported no risk variables being present. More than 50% of families reported conditions warranting a score of 1 or 2 on the risk index. Three or more risk variables were present in 29.1% of families, while 4 or more risk variables were present in 15.6% of families.

Pearson’s bivariate correlation analysis was performed to investigate relations among the risk variables. The full correlation matrix can be found in Appendix A. Most of the statistically significant intercorrelations can be considered low to moderate in size (Hinkle et al., 2003; Pallant, 2001). As previously mentioned, SES measures showed low to moderate intercorrelations with one another. Parents not living together (family status) was negatively related to most of the SES measures and positively related to measures of alcohol use and psychological symptoms. Parents not living together was curiously also positively related to the number of siblings in the household, i.e. increasing the likelihood of there being more siblings living in the household. Mother’s age at birth was positively related to the mother’s level of education, i.e. more educated mothers were more likely to give birth at later ages.

Table 2

*Number of Risk Variables in the Families*

Risk variables	Families	Percent
0	103	17.8
1	176	30.4
2	132	22.8
3	78	13.5
4	48	8.3
5	26	4.5
6	8	1.4
7	5	.9
8	2	.3
9	1	.2
<b>Total</b>	<b>579</b>	<b>100</b>

Regarding measures of alcohol use, how often parents were drinking was positively related to both parents' level of education. How many units were consumed in each instance was negatively related to the mother's level of education. Thus, more educated parents drank more often but in lesser amounts than less educated parents, while less educated mothers were more likely to consume more alcohol per instance. Measures of drinking behavior were positively related to parents' incomes, and negatively related to employment status and the number of siblings living in the household. This suggests that parental drinking behavior also is related to how busy the home situation is, as well as their available economic means.

**Outcome Measures and Cumulative Risk**

The second question posed concerned the possibility of finding associations between cumulative family risk and measures of social and cognitive development. Results are summarized in tables 3 and 4.

Significant associations were found for ToM ( $\beta = -.09, p < .05$ , two-tailed) and digit span ( $\beta = -.10, p < .01$ , two-tailed).

No significant associations with the cumulative risk index were found for the two social expectations variables, nor for whether the children had a best friend.

All outcome measures except for the best friend question were associated with the age of the child. Older children were more likely to have more correct ToM answers and obtain

Table 3

*Summary of Simultaneous Linear Regression Analyses for Cumulative Risk and Child Characteristics Predicting ToM and Digit Span*

Variable	ToM (n = 408)			Digit span (n = 401)		
	B	SE B	$\beta$	B	SE B	$\beta$
Age in months	0.03	0.00	.49**	0.17	0.01	.70**
Sex	0.08	0.07	.05	-0.32	0.26	-.05
Language level	0.03	0.17	.01	0.02	0.66	.00
Cumulative Risk Index	-0.05	0.02	-.09*	-0.22	0.08	-.10**

Note.  $R^2 = .25$  for ToM;  $R^2 = .50$  for Digit span. SE B refers to the standard error of B.

\* $p < .05$ , two-tailed. \*\* $p < .01$ , two-tailed.

Table 4

*Summary of Binary Logistic Regression Analyses for Cumulative Risk and Child Characteristics Predicting Best Friend and Social Expectations*

Variable	Best friend (n = 359)		Social expectation - positive (n = 388)		Social expectation - negative (n = 388)	
	Odds Ratio (95% CI)	p	Odds Ratio (95% CI)	p	Odds Ratio (95% CI)	p
Age in months	0.72 (0.98-1.03)	.37	<b>1.04</b> <b>(1.03-1.06)</b>	<b>.00</b>	0.99 (0.98-1.01)	.20
Sex (girls = 1, boys = 0)	1.00 (0.35-1.47)	.89	<b>1.88</b> <b>(1.23-2.87)</b>	<b>.00</b>	<b>0.55</b> <b>(0.36-0.84)</b>	<b>.00</b>
Language level	1.79 (0.58-5.46)	.31	0.86 (0.28-2.67)	.80	1.12 (0.38-3.33)	.84
Cumulative Risk Index	0.87 (0.70-1.06)	.16	0.96 (0.84-1.10)	.53	1.06 (0.93-1.21)	.38

Note. Statistically significant associations are given in a bold typeface.

higher scores on digit span. They were also slightly more likely to answer the social expectation task with a positive emotion.

Sex of the child was associated with the social expectations measures, with girls being more likely to answer with a positive emotion, and boys being more likely to answer with a negative emotion. No associations were found with the measure of expressive language.

Separate analyses were further performed for the digit span tasks, to control for the aggregation of this measure. These analyses are summarized in Appendix C. The cumulative risk index was significantly associated with digits span backwards, but not digit span forwards.

To control for possible confounding among outcome variables, Pearson’s bivariate correlation analysis was performed for these variables, and the matrix can be found in Appendix B. Except for the two social expectations variables, intercorrelations can be characterized as ranging from none to moderate (Hinkle et al., 2003; Pallant, 2001). Frequencies and distribution of scores for all outcome variables can be found in Appendix D.

**Outcome Measures and the Individual Risk Variables**

The third question posed in the study concerned the possibility of finding specific associations between individual risk factors and measures of social and cognitive development. Results are summarized in tables 5 and 6.

Table 5

*Summary of Simultaneous Linear Regression Analyses for Individual Risk Variables and Child Characteristics Predicting ToM and Digit Span*

Variable	ToM (n = 253)			Digit span (n = 247)		
	B	SE B	β	B	SE B	β
Age in months	0.02	0.00	.38**	0.18	0.01	.70**
Sex	0.06	0.09	.04	-0.18	0.32	-.03
Language level	0.17	0.25	.05	0.15	1.00	.01
Mother's age at birth	0.00	0.01	.04	0.01	0.04	.01
Family status	-0.13	0.23	-.04	0.46	0.76	.03
Sibship size	-0.00	0.07	-.00	0.08	0.23	.02
Family functioning	0.01	0.02	.04	0.11	0.07	.08
Psychological health of caregiver	-0.00	0.02	-.00	-0.12	0.07	-.08 <sup>+</sup>
Frequency of drinking	0.00	0.05	.00	-0.03	0.17	-.01
Amount of alcohol	-0.07	0.07	-.07	-0.33	0.22	-.07
Drinking as source of problems	-0.24	0.25	-.06	0.03	0.86	.00
Mother's education level	0.00	0.05	-.00	0.33	0.16	.12*
Father's education level	0.03	0.04	.05	0.11	0.15	.04
Mother's income	0.08	0.06	.09	0.22	0.19	.06
Father's income	-0.01	0.04	-.02	0.38	0.15	.13*
Mother's employment	-0.14	0.13	-.07	0.32	0.46	.03
Father's employment	-0.15	0.21	-.05	-0.69	0.70	-.05

Note.  $R^2 = .20$  for ToM;  $R^2 = .53$  for Digit span. SE B refers to the standard error of B.

\* $p < .05$ , two-tailed. \*\* $p < .01$ , two-tailed. <sup>+</sup> $p < .05$ , one-tailed.

Table 5 summarizes findings concerning individual risk variables, ToM, and digit span. ToM was not significantly associated with any of the individual risk variables measured. In this analysis, it was only associated with age of the child ( $\beta = .38, p < .01$ , two-tailed).

Performance on digit span was also associated with age ( $\beta = .70, p < .01$ , two-tailed). It was further associated with: (a) mother's level of education ( $\beta = .12, p < .05$ , two-tailed), (b) father's income ( $\beta = .13, p < .05$ , two-tailed), and (c) reported psychological health of the caregiver ( $\beta = -.08, p < .05$ , one-tailed).

In other words, higher performances on the digit span task were associated with higher levels of maternal educations, higher paternal incomes, and lower amounts of psychological symptoms reported by the caregivers. Effect sizes were small.

For the individual risk variables, separate analyses for the digit span tasks were performed to control for the aggregation of this measure. These analyses are summarized in Appendix E. Only maternal income was associated with digit span backwards, while digit span forwards was associated with maternal education, paternal income, and the amount of alcohol consumed by the caregiver in each instance.

Table 6 summarizes findings concerning individual risk variables, social expectations and the best friend question.

Whether children reported having a best friend was associated with reported psychological health of the caregiver ( $OR = 0.72, CI = 0.59 - 0.88, p < .01$ ) and fathers' income ( $OR = 0.50, CI = 0.30 - 0.82, p < .01$ ). Also fathers' employment status was significantly associated with whether children reported having a best friend, but because of the large confidence interval, this result must be interpreted with caution. The large confidence intervals noted in table 6 seem to be caused by small cell sizes.

Children were less likely to report having a best friend if the parents reported more psychological symptoms and, curiously, if their fathers reported higher incomes.

Age was associated with positive social expectations ( $OR = 1.05, CI = 1.03 - 1.07, p < .01$ ), but not with negative social expectations. A previous study employing this task found that the amount of children answering "I don't know" decreased with age (Eivers et al., 2009). In the current study, older children were more likely to report expecting the girl in the scenario to have a positive emotion, but younger children were not more likely to report the girl having a negative emotion. This is an indication that the decrease in children answering "I don't know" is connected to an increase in children answering with a positive emotion, but not with a

Table 6

Summary of Binary Logistic Regression Analyses for Individual Risk Variables and Child Characteristics Predicting Best Friend and Social Expectations

Variable	Best friend (n = 226)		SE - positive (n = 241)		SE - negative (n = 241)	
	Odds Ratio (95% CI)	p	Odds Ratio (95% CI)	p	Odds Ratio (95% CI)	p
Age in months	1.02 (0.98-1.06)	.25	<b>1.05</b> <b>(1.03-1.07)</b>	<b>.00</b>	0.99 (0.97-1.01)	.23
Sex (girls = 1, boys = 0)	0.52 (0.18-1.54)	.24	<b>2.14</b> <b>(1.19-3.84)</b>	<b>.01</b>	<b>0.48</b> <b>(0.27-0.86)</b>	<b>.01</b>
Language level	0.53 (0.07-3.92)	.53	1.08 (0.10-11.25)	.95	4.38 (0.57-33.58)	.16
Mother's age at birth	0.95 (0.84-1.07)	.37	<b>0.93</b> <b>(0.86-0.99)</b>	<b>.05</b>	1.05 (0.97-1.12)	.22
Family status	0.00 (0.00-0.00)	.99	1.70 (0.44-6.60)	.44	0.83 (0.23-3.04)	.78
Sibship size	1.01 (0.50-2.03)	.98	1.29 (0.85-1.94)	.23	<b>0.59</b> <b>(0.38-0.92)</b>	<b>.02</b>
Family functioning	0.99 (0.79-1.25)	.95	0.97 (0.86-1.10)	.67	0.98 (0.87-1.10)	.72
Psychological health of caregiver	<b>0.72</b> <b>(0.59-0.88)</b>	<b>.00</b>	0.99 (0.87-1.13)	.93	0.99 (0.87-1.13)	.90
Frequency of drinking	0.83 (0.46-1.52)	.55	0.76 (0.56-1.05)	.09 <sup>b</sup>	<b>1.39</b> <b>(1.02-1.90)</b>	<b>.04</b>
Amount of alcohol	1.73 (0.75-4.00)	.20	<b>0.59</b> <b>(0.39-0.88)</b>	<b>.01</b>	<b>1.57</b> <b>(1.05-2.36)</b>	<b>.03</b>
Drinking as source of problems	7.86 <sup>a</sup> (0.93-66.50) <sup>b</sup>	.06 <sup>c</sup>	0.80 (0.18-3.48)	.76	0.59 (0.14-2.46)	.46
Mother's education level	1.54 (0.93-2.54)	.09 <sup>c</sup>	<b>0.73</b> <b>(0.55-0.96)</b>	<b>.03</b>	<b>1.37</b> <b>(1.03-1.81)</b>	<b>.03</b>
Father's education level	1.00 (0.62-1.60)	.98	<b>1.35</b> <b>(1.02-1.77)</b>	<b>.03</b>	0.81 (0.62-1.06)	.12
Mother's income	1.63 (0.88-3.02)	.12	1.20 (0.85-1.70)	.31	0.76 (0.53-1.08)	.12
Father's income	<b>0.50</b> <b>(0.30-0.82)</b>	<b>.01</b>	1.16 (0.88-1.52)	.30	0.82 (0.63-1.08)	.16
Mother's employment	0.82 (0.21-3.25)	.78	1.12 (0.49-2.55)	.80	0.81 (0.35-1.85)	.61
Father's employment	<b>5.65</b> <sup>a</sup> <b>(1.03-30.99)</b> <sup>b</sup>	<b>.05</b>	1.27 (0.37-4.39)	.70	1.32 (0.36-4.79)	.67

Note. Statistically significant associations are given in a bold typeface.

<sup>a</sup> The codings of these two variables were reversed for this analysis, meaning that yes = 1 and no = 0. <sup>b</sup> These associations have very large CIs, and need to be interpreted with caution. The large CI is probably caused by the small cell sizes involved. Outliers are not the cause, as these risk variables and the outcome variable are all dichotomous. <sup>c</sup> When using a one-tailed test of significance this association is significant at the  $p < .05$  level.

negative emotion, as they grow older.

Sex was associated with both positive ( $OR = 2.14$ ,  $CI = 1.19 - 3.84$ ,  $p < .01$ ) and negative ( $OR = 0.48$ ,  $CI = 0.27 - 0.86$ ,  $p < .01$ ) social expectations. Girls were about twice as likely as boys to report positive social expectations and half as likely to report negative expectations.

The individual risk variables associated with reports of positive social expectations were: (a) maternal age at birth ( $OR = 0.93$ ,  $CI = 0.86 - 0.99$ ,  $p < .05$ ), (b) amount of alcohol the caregiver reported drinking in each instance ( $OR = 0.59$ ,  $CI = 0.39 - 0.88$ ,  $p < .01$ ), (c) the mother's level of education ( $OR = 0.73$ ,  $CI = 0.55 - 0.96$ ,  $p < .05$ ), and (d) the father's level of education ( $OR = 1.35$ ,  $CI = 1.02 - 1.77$ ,  $p < .05$ ).

The children were, in other words, less likely to report a positive emotion in the social expectations task when maternal age at birth was higher; when the mother reported higher levels of education; or when the caregiver reported higher consumption of alcohol in each instance. On the contrary, children were more likely to report a positive emotion in the social expectations task when the father reported higher levels of education.

The risk variables associated with reports of negative social expectations were: (a) how often the caregiver reported drinking alcohol ( $OR = 1.39$ ,  $CI = 1.02 - 1.90$ ,  $p < .05$ ), (b) amount of alcohol the caregiver reported drinking in each instance ( $OR = 1.57$ ,  $CI = 1.05 - 2.36$ ,  $p < .05$ ), (c) the mother's level of education ( $OR = 1.37$ ,  $CI = 1.03 - 1.81$ ,  $p < .05$ ), and (d) number of siblings living in the household ( $OR = 0.59$ ,  $CI = 0.38 - 0.92$ ,  $p < .05$ ).

In other words, children with caregivers drinking alcohol more often and drinking more in each instance, as well as those whose mothers reported higher levels of education, were more likely to report a negative emotion in the social expectations task.

## Discussion

### *Main Findings*

1. There was surprising variation among families in the present sample concerning the occurrence or nonoccurrence of developmental risk connected to the family environment.
2. Family risk factors were associated with measures of young children's social and cognitive development.

3. Both a cumulative approach and an individual factor approach to family risk were associated with developmental outcomes, but the associations differed for the two approaches.

### ***Occurrence of Risk Factors***

The first aim of the study concerned investigation of what kind and what level of family risk factors could be found in an assumed low-risk, semi-rural, Norwegian sample of children between the ages of two and seven. Frequency analyses of the data confirmed that many traditional family risk factors had low occurrence in this sample compared to previous studies. This especially concerned factors traditionally tied to high-risk groups, like low maternal age at birth (Côté et al., 2007; Trentacosta et al., 2008), single parent households (Burchinal et al., 2000; Candelaria et al., 2006; Gutman et al., 2002, 2003; Seifer et al., 1992; Trentacosta et al., 2008), low maternal education (Burchinal et al., 2000; Côté et al., 2007; Gutman et al., 2003; Sameroff et al., 1987; Trentacosta et al., 2008), low income (Ackerman, Schoff, et al., 1999; Gutman et al., 2002), number of children in the household (Burchinal et al., 2000; Sameroff et al., 1987; Seifer et al., 1992), and parental unemployment (Liaw & Brooks-Gunn, 1994). What is surprising is the variation among families in terms of number of family risk factors seemingly present. Despite the generally low levels of risk reported, less than one-fifth of families report none of the risk variables being present. More than half the families reported presence of two or more risk variables.

It is possible that the numbers of risk factors present in the families is somewhat overestimated because some of the variables were dichotomized in data-dependent ways, by using quartiles. This especially concerns maternal and paternal income. The current sample was recruited in a semi-rural area, where living costs are lower than in more urban areas. Furthermore, it is a relatively more affluent sample than often studied in this field. It may therefore be that only a very small proportion of the parents in the study have incomes low enough to warrant it being named a risk factor in their children's development. Even if the sample as a whole is affluent, however, it is possible to view SES as a relative risk. SES never works in isolation from contextual factors. It is possible, thus, that having an income in the lower quartile of the people in the area in which one lives carries comparable amounts of developmental risk, regardless of the general level of affluence in the population under study.



Data that has been split in data-dependent ways are, however, difficult to compare across studies.

In line with similar studies (Deater-Deckard et al., 1998; Evans, 2003; Farrington & Loeber, 2000), the current study indicates that family risk aggregates in some families and individuals. Even in a low-risk sample, there seems to be an identifiable subgroup that can be labeled *high-risk*. This suggests that even in low-risk samples, family risk factors are not evenly distributed among individual children. This could have implications regarding possible interventions.

In sum, there was low occurrence of many traditional family risk factors in the current sample. Even with such low occurrence, most families reported presence of family risk factors. These factors do not seem to be evenly distributed among families. It may be that resilience processes are also at work in this population, minimizing the impact of belonging to such a group. Thus, investigations of the effects of family risk factors in low-risk groups are needed to determine if these are comparable to effects of family risk factors in high-risk groups. However, possible resilience processes being at work does not exclude the possibility that generally high levels of affluence in the population does not protect all children in such a population against negative influence from developmental risk. Even in this low-risk sample, it seems possible that there are children who experience greater familial risk and that such experiences may lead to more negative effects on developmental outcomes.

### ***Risk Factors in Social and Cognitive Development***

The second main finding of the study was that the measures of family risk were associated with measures of children's social and cognitive development. It should be pointed out that because all observed associations are correlational, it is not possible to draw conclusions regarding directions of causality nor about the effects of third variables. However, this findings still is an indication that even if levels of developmental risk are low at a group level, they do influence the development of individual differences in children. Some researchers have encouraged others in the field to move away from focusing solely on linear relationships between identified risk factors and developmental outcomes and attempt to disentangle risk mechanisms and processes (O'Connor & Rutter, 1996; Rutter, 1994, 2007b; Sameroff, 2000). So how exactly do risk factors work in influencing the development of young children?

### *Sex*

Associations with sex were found only on the social expectations task. Girls were more likely to report positive expectations for the outcome of social interaction and less likely to report negative expectations. Boys were more likely to report negative expectations and less likely to report positive expectations. This is in accordance with an earlier study, where preschool girls were more socially proficient than boys the same age (Denham et al., 2002). Low levels of social proficiency and poor emotion understanding has furthermore been found to be related to increases in aggressive behavior and negative social expectations (Denham et al., 2002, 1994; Orobio de Castro, Brendgen, Van Boxtel, Vitaro, & Schaeppers, 2006; Orobio de Castro et al., 2005, 2003). A possible confounding factor concerning the current finding, however, is that the picture of the ambiguous situation used in the social expectations task only included girls. This may have affected girls' and boys' answers on the task in different ways, because children's social expectations may be different in social interaction with same-sex and opposite-sex peers respectively (Freniere, Strayer, & Gauthier, 1984; Rose & Rudolph, 2006).

All children in the study attended kindergarten and are likely to have been involved in similar situations to the one in the scenario. Because girls this age have been shown to be more socially proficient, it is possible that they also have more experience of social interaction with other children leading to positive outcomes. The boys may have experienced more social interactions with peers involving more negative outcomes. Thus, the observed sex difference in social expectations could be a result of the quality of social experiences. A related possibility is that girls function better socially at this age because they have more positive expectations concerning interaction with peers, making positive outcomes of such interaction more likely. The processes may also be reciprocal, mutually reinforcing each other.

### *Cumulative Risk*

Cumulative family risk can be understood as a measure of general family hardship. It was only associated with children's ToM and digit span performance. It is possible that processes underlying the development of skills affecting ToM and digit span are influenced by the general level of challenge faced by the family, through impacting on quantity and quality of time parents are able to spend with their children. Children spending time with parents, reflecting over social processes and other people's thought processes, is crucial in the

development of ToM (Dunn et al., 1991). Parents experiencing more difficulties can have both their emotional states and energy levels affected, which could again influence their interactions with their children. In fact, several studies have found socialization and parenting practices to affect development of ToM and emotion understanding in non-clinical samples (Cutting & Dunn, 1999; Denham et al., 1994; Dunn et al., 1991; de Rosnay et al., 2004).

The results of the current study can be taken to suggest that ToM development is influenced primarily by the general level of difficulties faced by the family, and not by any of the parental characteristics measured in particular. As for the associations between cumulative risk and digit span, this could be explained by the same mechanisms also affecting the quantity and quality of cognitive stimulation by parents. Previous research indicates that also cognitive development is influenced by parenting variables and socialization practices (Gutman et al., 2003; Liaw & Brooks-Gunn, 1994; Seifer et al., 1992). Such practices are likely to be affected by the families' general level of difficulties.

#### *Psychological Health of the Caregiver*

Reported psychological symptom load of the caregiver was associated with digit span and whether the children reported having a best friend. Associations with digit span were weak. One possible explanation for the association with digit span would be similar to the one for the association between digit span and cumulative risk, namely that psychological health of parents can affect interaction patterns in the family and thereby also the quantity and quality of cognitive stimulation for the children. The directionality of this association may, however, also be the opposite, that poor cognitive function in children increases depressive or anxious symptomatology in parents.

The association with whether the children reported having a best friend has several candidate explanations. Most of these involve mediation by changes in interaction patterns in the family. Such changes may occur either between the parent reporting symptoms and the child, or in the family in general (Kim-Cohen et al., 2006; Stein et al., 2008). Changes in both quantity and quality of social interaction in families, related to parental symptomatology, may be connected to variations in children's social development.

Concerning the quantity of interaction, it is possible that depressed or anxious parents interact less with their children than other parents (Goodman & Gotlib, 1999). These children could thereby receive less social guidance and get to practice their social skills less than other

children, resulting in their skills being less developed. Having a depressive or anxious parent may further lead to socially sensitive children being more worried and preoccupied with taking care of their parents (Goodman & Gotlib, 1999). This could lead to children spending more time with their parents and less time with peers than they otherwise would. The processes may further be reciprocal, involving children spending more time with but at the same time having less social interaction with parents.

Concerning the quality of interaction patterns, children learn and imitate the interaction patterns of their parents by processes of social learning (Cole et al., 2005). They may then enact these possibly disturbed interaction patterns of their depressed or anxious parents with their peers. A final possibility is related to findings that parents with depressive or anxious symptomatology generally seem to interact with their children in ways that are less likely to increase children's confidence and social competence than other parents (Goodman & Gotlib, 1999; Kim-Cohen et al., 2006; Schultz et al., 2000). This could lead to children feeling less confident in social relationships, making them wary of seeking contact with peers. Such wariness is likely to influence children's ability to build friendships.

In sum, there are several possible explanations for the association between parental psychological symptom load and children's social development. What they all seem to have in common is that they involve parental psychopathology having adverse influences on family interaction, and such disruption of interaction patterns impinging negatively on children's development.

### *Use of Alcohol in the Family*

Both higher frequencies of alcohol use and larger amounts consumed in each instance were negatively associated with children's social expectations. Further, there was a nonsignificant tendency for drinking as a source of problems in the family to be negatively related to children's friendships. These results are a strong indication that a high level of parental alcohol use is a risk factor in children's social development. Parental alcohol abuse can have pervasive effects on emotional development well into adulthood (Domenico & Windle, 1993; Mathew, Wilson, Blazer, & George, 1993; Woititz, 1983), as well as increasing the risk for a host of negative outcomes (Harter, 2000). Furthermore, any discord or conflict between parents is likely to affect children (Stein et al., 2008).

High alcohol consumption may reflect an underlying wariness or social anxiety, making alcohol necessary for parents to feel socially confident. It is possible that children are socialized into such an underlying wariness, i.e. that it is not the level of alcohol consumption per se influencing children's development. However, the associations between alcohol consumption and social expectations were observed even when controlling for the psychological health of parents, speaking against such an explanation.

Another possibility is that young children with parents who have high alcohol consumption could have been through frightening experiences watching their parents' behavior change while under the influence of alcohol. Such experiences could generate a tendency to have negative social expectations because other people are perceived as unpredictable. This could further lead to difficulties forming friendships (Keane & Parrish, 1992; Schultz et al., 2000).

### *Socioeconomic Conditions*

Of the socioeconomic measures, mothers' education level and fathers' income had the strongest associations with developmental outcomes. For digit span, this can possibly be explained by genetic factors, but if this was the only explanation we might have expected to find similar associations also with mothers' income and fathers' education level.

Another possible explanation for these associations being strongest is that what is often perceived as traditional gender roles may be predominant in the sample. Such an explanation would imply the father having a traditional breadwinner role and the mother taking a larger share of responsibilities concerning child care. This could explain why maternal education was more strongly associated with outcomes, especially cognitive ones. As such, mothers' education would be, practically speaking, a more proximal factor in children's development than fathers' education. Fathers having higher incomes may further allow mothers to work less, which in turn could affect the amount of cognitive stimulation in the household. This is supported by the finding that fathers, on average, worked almost ten hours more per week than mothers. Another finding supporting this line of reasoning is that even though mothers were more educated on average, fathers, on average, made more money.

Mothers' level of education as a predictor of various aspects of child development is well researched, partly because studies have chosen to focus on this variable, excluding other aspects of SES (Côté et al., 2007). In the current study maternal education was positively

associated with a measure of cognitive development, and there was a nonsignificant tendency indicating that maternal education may also be positively related to children's friendships.

More difficult to explain is the rather contra-intuitive finding that maternal education level was negatively related to children's social expectations, especially considering that higher paternal education seemed to have the opposite effect. One possible explanation is that mothers with more education had busier schedules, and that this affected their children differently than did fathers' busy schedules. Considering the possibility of more traditional gender roles being predominant in the sample, it is further possible that mothers who were working still had a bigger share of responsibility concerning child care. This could be one reason for the negative association with maternal education, and not paternal education. A possible explanation for the positive association between fathers' education and social expectations is that more educated fathers take part in their children's upbringing more directly. Fathers taking more directly part in children's upbringing could have the potential to give children a more varied socialization experience in the household and forming closer attachments with two caregivers instead of just one. This could be a possible mechanism mediating the relationship between paternal education and social expectations in the current sample.

Also maternal age at birth was negatively related to children's positive social expectations. Previous research on this risk factor has focused almost exclusively on risk carried by having a mother giving birth when very young. In the current sample, average maternal age at birth was almost 30 years, which means that most of these mothers are well into their thirties when the children are attending kindergarten. Luthar and colleagues have suggested that it is not just being in the lowest-scoring percentages of the population on SES that involves increases in developmental risk, but also being in the highest-scoring (Luthar & Latendresse, 2005; Luthar & Sexton, 2004). They maintain that it is having extreme scores that carry developmental risk, regardless of such scores being above or below the mean. The same might be true for maternal age at birth, as women who are older when giving birth may have less social support from grandparents, and may have grown accustomed to an adult lifestyle without children in other ways than younger mothers. These possible differences between mothers connected to the ages at which they gave birth may, thus, be connected to the social support and practical help they receive in the upbringing, having a direct influence on their freedom to enjoy activities also without their children. The mentioned differences could also

lead to variations in home environments, with older mothers possibly creating home environments less suited to bringing up children. The observed negative association between higher maternal age at birth and social expectations may therefore be connected to the distribution of maternal age at birth in the current sample. Another possible explanation is that older mothers have more children and that the children in the study have to compete with their older siblings for attention. This explanation is unlikely, however, as also number of siblings in the household was controlled for and seemed to pull in the opposite direction on this outcome variable.

While maternal education level and paternal income seemed to pull in the same direction on the digit span measure, there was a tendency towards them pulling in opposite directions with regard to how likely the child was to have a best friend. One possible explanation may be connected to the fact that half the workforce in the municipalities where the study was conducted commute on a regular basis. Higher incomes are often connected to longer working hours. It could be that the children of the fathers with the highest incomes see less of their fathers than children with fathers making less money and working in the local area. By seeing less of their fathers, these children could potentially receive less varied socialization experiences in the home, affecting their social skills and their social flexibility in interacting with peers. Mechanisms mediating such effects could be connected both to the father not being in present in the household, as well as the mother being more alone with and therefore also more occupied with household chores.

### *Potency and Effect Sizes*

Several of the risk variables in the study were significantly associated with developmental outcome measures. Most of the observed effect sizes in the current study were small, and some researchers may claim that this makes the findings less important (Kraemer et al., 1999, 2005). However, small effect sizes and small individual differences in young children may develop into larger effect sizes and larger individual differences in older children, adolescents, and adults (Appleyard et al., 2005; Rutter, 2005c; Werner, 1957). The sample of the current study consisted mainly of preschool children. Little previous research on risk factors has been conducted on children so young. It is possibly necessary, therefore, to settle for smaller effect sizes than in previous research, simply because real effects may indeed be smaller. Even if

small, the observed associations seem likely to have some degree of impact in the children's development.

### ***Cumulative Risk Versus Individual Risk Factors***

Both a cumulative approach and an individual factor approach to family risk were associated with developmental outcomes, but the associations differed for the two approaches. ToM was associated with cumulative risk only. Digit span was associated with both cumulative risk and some of the individual risk factors, whereas children's answers on the social expectations task and their reports of having a best friend were not associated with cumulative risk, only with individual risk factors.

Few previous studies have combined cumulative risk and individual risk factor approaches to the investigation of possible effects of family risk. Thus, few conclusions have been drawn concerning the relationship between the two approaches. One important exception is a study concluding that individual risk factors considered together provided better predictions of developmental outcomes at a particular age, but were less useful regarding predictions of developmental patterns (Burchinal et al., 2000). These researchers further stated that both an individual risk factor approach and a risk-index approach were viable methods for relating social risk to developmental patterns.

Based on the current study, it is possible to draw the conclusion of Burchinal and colleagues (2000) even further. An exclusive focus on either approach in the current study instead of using them both would have led to rather different conclusions being drawn. Because not all outcome measures were related to both cumulative risk and individual risk factors, a single-approach focus would have led to missing some of the observed associations between family risk factors and outcome measures. Missing these associations would probably also have involved making different, and possibly wrong, conclusions regarding the existence of associations between family risk factors and certain developmental outcomes. This leads to the conclusion that these two approaches to developmental risk are not simply two viable options as claimed by Burchinal and colleagues, but are in fact equally necessary perspectives that need to be included simultaneously in studies concerning developmental risk.



The next question arising is if these findings are generalizable or are more likely to be an artifact connected to properties of the current study. The latter explanation certainly is possible, and among other things the composition of the cumulative risk index may have affected findings. On the other hand, the findings of the current study are comparable to previous research that often have found associations between cumulative risk and cognitive measures (Gutman et al., 2002, 2003; Liaw & Brooks-Gunn, 1994; Sameroff et al., 1987), but not with social and emotional measures to the same degree (Ackerman, Schoff, et al., 1999; Deater-Deckard et al., 1998). Studies focusing on individual risk factors also have findings comparable to those of the current study concerning associations between such factors and measures of social and cognitive development (Liaw & Brooks-Gunn, 1994; Pike et al., 2006). In sum, associations between outcome measures and both cumulative risk and individual risk factors are in line with previous findings.

#### *Aggregate Measures*

It is possible that the current study found associations with cumulative risk only on ToM and digit span because cumulative risk is related to children's cognitive development, like some researchers have claimed (Gutman et al., 2003; Sameroff et al., 1987). Another possibility is that associations with cumulative risk were found for these outcomes because they are aggregated measures. The two digit span tasks have, for instance, been maintained to measure two different and unrelated cognitive abilities (Lezak et al., 2004). Other researchers have further claimed that ToM includes different and possibly unrelated elements (Cutting & Dunn, 1999).

To investigate this possibility, analyses were performed for the two digit span tasks separately. Cumulative risk had stronger associations with the more complex of the two tasks, digits backward, while more associations with the individual risk factors were found for the simpler measure, digits forward. The results lend some support to the hypothesis that the kind of associations found with cumulative risk and individual risk factors, respectively, will depend on how much behavior is aggregated in both the risk and outcome measures.

The current study suggests that investigation of individual risk factors and their specific associations with measures of development is an approach that can bring us one step closer to disentangling risk mechanisms. It concurrently suggests that cumulative risk indexes have an important place in research concerning developmental risk, as these will be better predictors

of aggregated or more complex behavior. In other words, cumulative risk is important because it seems to be a better predictor of overall development over time, but it is unlikely to bring us any closer to grasping in more detail the mechanisms involved in creating the associations between cumulative risk and developmental outcomes.

### *Disaggregating SES*

Findings regarding relations between various outcome measures and the different aspects of SES further underline the need for investigation of individual risk factors and their effects. Different aspects of SES were in the current study associated with different outcome measures. Furthermore, different aspects of SES seemed to work in opposite directions on some outcome variables. For instance, fathers' income was negatively related to whether children reported having a best friend, but positively related to children's performance on digit span. Mothers' and fathers' level of education also seemed to pull in opposite directions on the social expectations task.

Together these findings suggest that the same aspect of SES may work as a protective factor in one developmental context and a risk factor in another one. Further, it may be that aspects of SES work as risk or protective factors in some contexts due to the presence or absence of third variables related to the total constellation of SES factors, as well as such variables' relations to outcomes. Combining different aspects of SES into a composite score would mask such effects and could even lead researchers to faulty conclusions regarding whether and how SES is associated with certain developmental outcomes.

### *A Note on Causality*

Data in the current study are correlational. Data on risk were collected a year prior to the outcome measures. Demonstrating that something is a risk factor for an outcome does not equal a causal relation, only that it is a correlate temporally preceding the outcome. According to Rutter (2007b, 2008), some characteristics of studies like the current one can strengthen indications of causal relations, even if results are correlational. Risk being measured before outcome in the current study, makes it more likely that they are causally related than if data had been purely cross-sectional. Also making the basis for causal interpretations stronger is the fact that different informants were used for risk and outcome measures. Finally, the

findings being in line with previous research further strengthens the foundation for exploration of causal hypotheses. The current study still has considerable weaknesses and limitations in light of the criteria specified by Rutter (2007b). This means that any conclusions regarding causality based on the current results are not warranted.

### ***Strengths and Limitations***

#### *Participants*

Kindergartens were used as arenas for recruiting participants. Not all the children in the two municipalities attended kindergarten, and questions can therefore be raised concerning problems of social selection in the sample. This further varied with the age groups included. Previous research indicates that there are differences between parents who put their children in kindergarten before the age of three, and those who do not (Borge et al., 2004). In the case of the current study, social selection effects seem indeed to be stronger for the younger children than for the older children included. However, because most participating children in the study were in the older age groups, this possible social selection bias was not taken into further consideration for the data analyses. It is still necessary to keep it in mind when interpreting the findings, because it may have reduced the representativeness of the sample.

All kindergartens in the two municipalities were involved in recruiting participants, so it is unlikely that the representativeness of the sample was hampered because of social selection into any particular kind of non-maternal childcare. The kindergartens represent the whole range of day care services available in Norway and should, in this manner, be representative of the kind of day-care facilities Norwegian preschoolers attend in general.

Participants were recruited in a semi-rural area, which makes generalizations to urban settings difficult. The sample also had generally low occurrences of many family risk factors. It is possible that risk factors work in qualitatively different ways in low- and high-risk populations. Findings are thus not necessarily generalizable to populations with higher general levels of risk occurrence. Contextual factors possibly affecting the municipalities where the study was conducted also inspire caution in generalizing findings to other contexts. Proximity to the capital city, inhabited areas being spread over a large area, as well as having a relatively stable population with little moving into or out of the area are all aspects that may

have influenced the representativeness of the sample by contributing to greater homogeneity of risk than what will be the case in other populations.

It is a further weakness of the study that some families could have had more than one child in the sample, and that this was not controlled for during recruiting procedures. Parent reports of parental characteristics and demographic information are unlikely to vary considerably for siblings. All outcome measures were from the interviews with the children and are also unlikely to have been affected by this possible dependency in data. In sum, this weakness should not have made any major impact on results.

Strengths of the current study connected to the participants include the large sample size, and the fact that the sample included younger children than most often has been the case in previous research on risk factors.

### *Design and Procedures*

The children's performance on outcome measures at the time data was collected on risk was not controlled for in the current study. This is a definite weakness. Controlling for this, excluding the possibility that observed individual differences on outcome measures were already present during the first data collection, would have strengthened causal interpretations of the findings.

An attempt was made to increase comparability with previous research by utilizing the same cutoffs for defining groups as high risk. A potential problem with this approach is that the same maternal age at birth, for instance, may have hugely differing correlates and implications in low- and high-risk populations. Separating low- and high-risk individuals on variables that are measured on continuous scales will always be somewhat arbitrary, as the true cutoffs between low and high risk will vary with the sample, population, and variable under study, as well as contextual aspects. The latter limitation concerns most research in the field of risk factors and human development. The use of cutoffs similar to those of previous research can still be considered a strength, even if it made thresholds for labeling a score as high-risk very strict on some of the variables.

Measurement error is always a challenge in research involving behavioral measures (Pedhazur & Schmelkin, 1991). This may have led to faulty estimations concerning the size of associations in the study. However, biasing effects are usually larger when reliability of measures is low and variables are highly correlated. Neither of these conditions were present

in the current study, decreasing the likelihood of faulty estimations concerning the size of associations.

Interaction effects between risk variables were not investigated in the current study. It is possible that some of the risk variables are moderated or mediated by other occurring risk variables. For example, maternal education could especially be related to cognitive outcomes when paternal income is higher and the parents are living together. Considering the number of risk variables included in the study, the amount of possible interactions is very large. Furthermore, the occurrence of several of the risk variables was low. This is likely to result in cell sizes being too small to conduct a proper investigation of three-way interactions between many of the risk variables and outcomes in the current sample without further clustering risk variables into composite scores. However, the present study provides some indications of possible hypotheses to investigate in future research.

Another strength of the current study is the temporal sequence in which data was collected; data on risk collected a year prior to data on outcomes. Moreover, previous research has often used parental reports for both risk and outcome measures (see for instance Pike et al., 2006), while the current study used parental reports for measures of risk and children's own subjective reports as outcome measures. Use of different informants for risk and outcome measures can be considered a strength of the current study (Rutter, 2007b).

### *Measures*

Another weakness of the current study is that because of the large sample, time, and costs involved, rather crude measures of social and cognitive development were employed. Measures like digit span or ToM cannot compare to a full cognitive or clinical assessment; they can only give an approximate estimate of cognitive functioning.

Despite their shortcomings, measures like digit span and ToM have been utilized in previous research (Cutting & Dunn, 1999; Dunn et al., 1991; Sameroff et al., 1987). Considering the complexity of ToM skills, however, it is possible that the measures used in the current study have limitations with regard to how well they measure such skills. Only two tasks were used and they were both related to the false belief component of ToM, not necessarily related to other ToM-related abilities like emotion understanding (Cutting & Dunn, 1999).

The other social measures used in the current study have not been widely employed in previous research of this kind, which could make it difficult to be certain of what they measure. The social expectation task may have been too difficult for some of the young children, as it requires use of both ToM skills and hypothetical reasoning.

Young children often answer questions regarding enduring conditions more in relation to their current state than older children and adults do (Cole et al., 2005; Sachs, 1983). This could have affected the children's reports of whether they had a best friend. It is possible that parents' or preschool teachers' reports of whether children had a best friend would have been a more accurate measure of children's friendships. However, asking the children directly is more likely to measure aspects of their own subjective perception concerning the status of their closest social relationships with peers.

Contextual effects may have further affected children's scores on the social measures employed in the current study. Both the social expectations task and the best friend question are oriented towards the child's functioning in kindergarten, which may have affected the observed pattern of outcomes' associations with cumulative risk and individual risk factors. The findings on digit span speak against such an interpretation, as it was found to be related to both cumulative risk and individual risk factors. This implies that contextual effects alone cannot account for the difference of associations between outcomes and the two approaches to developmental risk.

No associations were found for the measure of children's expressive language level. Language development has been claimed to be of central importance in the development of ToM (Pons et al., 2009). This gives reason to question whether the language measure in the current study was adequate. It is also, however, possible that no associations were found because there was so little variation in language development in the sample, when controlling for age, that language level did not make a significant impact on outcome measures. Furthermore, the current study is cross-sectional and it might be that language development is a significant factor in the development of ToM in children younger than those in the current study. Finally, the language measure employed primarily concerns complexity of expressive language and it is possible that other aspects of language development are more central to development of ToM. In sum, there are limitations connected to the language measure employed, but the extent of these is unclear.

### *A Note on Genetics*

Finally, the current study has not controlled for genetic variance in any way, which is a considerable weakness in research on family risk. It opens up for the possibility that some of the observed associations are, in their entirety, caused by genetic factors (Kendler, 1996; Rutter, 2006, 2007b). Regardless of whether or not the observed associations reflect causal relationships or are caused by a third variable, like genetics, the observed associations work as markers of family risk in children's development in the current sample. The observed associations for some outcomes are also in line with previous research having controlled for genetic variance (see Hughes et al., 2005), suggesting that the risk factors in the current study are indeed involved in developmental processes of some kind, affecting children's social and cognitive development.

### ***Suggestions for Future Research***

First and foremost, the current study underlines the need to include both cumulative and individual factor approaches in future studies of family risk.

Findings from the current study also underline the need to disaggregate measures of SES in the study of family risk. Future research should further our understanding of how different aspects of SES are related and operate in different contexts and developmental domains. Treating SES as a single, unified concept may lead to a false sense of comparability across studies where in reality different aspects of SES are operating. It also makes it more difficult to identify the processes through which individual SES factors might influence the relationships between outcomes and other risk factors.

It will also be important for future research on family risk to move beyond cross-sectional and single-informant longitudinal designs. As pointed out by Rutter (2007b), measuring both risk and outcomes at multiple points in time using multiple informants would improve the foundation of possible causal interpretations.

Finally, the need to include data on fathers in studies concerning family risk should be taken into consideration by future research. In the current study, significant associations were found between paternal characteristics and outcome measures. Developmental psychology has long been criticized for focusing too much on maternal characteristics and mother-child interplay, ignoring fathers and other caregivers (Burman, 2008). Considering the findings of the current study, operationalizing family influence by focusing research exclusively on the

mother-child dyad seems too narrow. Fathers today are playing a more direct part in their children's upbringing than ever before and research on family risk needs to take this into account when designing studies. It is also a possibility that genetic aspects of development in some cases may be more related to paternal than maternal characteristics, for instance by parental imprinting (Rutter, 2006), further underlining the need to include data on fathers in future research. In addition to this, paternal characteristics are likely to affect mothers, and could thereby also have more indirect influence on child development.

### ***Implications for Intervention***

The current study was not designed to investigate interventions and their effects. The purpose of research on risk factors in general, however, has often been conceptualized as the identification of risk and protective factors for use in intervention to minimize the impact of negative developmental conditions. The current study may therefore have implications for intervention, even though investigation of intervention, as such, was not its primary purpose.

Because effect sizes in the current study are small, some may maintain that findings are of relative unimportance from a clinical perspective (Kraemer et al., 2005). As we have seen, however, the opposite may indeed be the case. In fact, identification of particular individual differences at an early age that only later seem to have obvious clinical significance, often termed precursors, is central to research concerning disturbances like, for instance, schizophrenia (Green, 2001; Jones & Tarrant, 1999).

Results from the current study suggest that extensive use of alcohol in the household may be negatively related to children's social development. It is widely accepted that alcohol abuse by parents can have pervasive effects on emotional development through the lifespan (Domenico & Windle, 1993; Mathew et al., 1993; Woititz, 1983). When individual differences related to alcohol use can be found in preschool age children, this is an indication that alcohol use might be a worthwhile target of intervention. Alcohol use by parents should be easily modifiable and could be a target of a universal preventive intervention, intervening at the population level (Vitaro & Tremblay, 2008). More studies are needed, however, to determine causality as well as to identify protective factors, design interventions, and investigate potential effects of such interventions.



Targeting high-risk individuals for multilevel intervention has previously proven to be a useful strategy in ameliorating adverse consequences of family risk (Love et al., 2005). There are also studies indicating that kindergartens may serve as a useful arena for intervention for high-risk children (Borge et al., 2004; Côté et al., 2007; Groark & McCall, 2008; Howes, Rodning, Galluzzo, & Myers, 1988). Especially in a sample such as the current one, where an overwhelming majority of children attended kindergarten, this might be the case. Findings in the current study suggest that family risk factors seem to aggregate in some families and individuals, even in populations with generally low levels of risk. More studies are needed, however, to determine if belonging to a high-risk groups in a low-risk population have similar consequences to belonging to a high-risk group in a high-risk population. On a related note, studies also need to identify thresholds for when implementation of interventions could be profitable for high-risk individuals in low-risk populations.

A challenge of researching and designing interventions for a population like the current one, is that most available approaches to intervention have originally been designed for use in high-risk populations. It is thus difficult to determine if they are applicable in a population with generally low levels of family risk factors or if new, specially adapted programs for intervention need to be conceived.

### ***Conclusion***

The current study found that even in a sample where general levels of family risk are low, it was possible to identify high-risk individuals, and some level of family risk seemed to be present in the lives of a majority of the children. Significant associations between family risk factors and outcomes in the social and cognitive development of the children were also found in the sample. Findings concerning associations between risk factors and developmental outcomes are likely to depend on the measures employed, among other things if such measures are specific or more aggregated measures of risk and/or behavior. Both cumulative risk approaches and approaches focusing on individual risk factors are needed for further exploration of the relationship between family risk and children's social and cognitive development.

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Appendix A

*Intercorrelations of Risk Variables in the Study (n = 375-579)*

	Mother's age at birth	Family status	Sibship size	Family functioning	Psychological health	Frequency of drinking	Amount of alcohol	Drinking as ...	Mother's education	Father's education	Mother's income	Father's income	Mother unemployed	Father unemployed
Family status	-.12*													
Sibship size	.01	.10*												
Family functioning	.06	-.06	-.03											
Psychological health of caregiver	.03	.20**	.04	.00										
Frequency of drinking	.22**	.01	.02	-.07	.08									
Amount of alcohol	-.21**	.20**	-.11*	.05	-.02									
Drinking as source of problems	.09	.14**	-.05	.23**	.05	-.00	-.02							
Mother's education level	.12**	-.11**	-.02	-.03	.01	.18**	-.11*	-.02						
Father's education level	.05	-.13**	.08	-.05	-.06	.19**	.01	-.03	.44**					
Mother's income	.10*	-.10*	-.06	-.02	-.07	-.01	.11**	-.02	.32**	.18**				
Father's income	.07	-.16**	-.02	-.01	-.08	.12**	-.01	-.07	.20**	.26**	.19**			
Mother unemployed	.05	.03	-.02	.01	.06	-.15**	-.09*	.02	-.15**	-.13**	-.16**	-.01		
Father unemployed	-.01	.28**	.02	.01	.03	-.09*	-.06	.06	-.18**	-.15**	-.03	-.23**	.13**	
Cumulative Risk Index (CRI)	-.06	.46**	.07	.16**	.35**	-.09*	.11*	.28**	-.43**	-.38**	-.43**	-.45**	.36**	.40**

\*p < .05. \*\*p < .01.

**Appendix B**

*Intercorrelations of Outcome Variables in the Study (n = 396-487)*

	Theory of mind	Digit span	Best friend	Social expec- tation - positive
Digit span	.47**			
Best friend	.08	.12*		
Social expectation - positive	.18**	.22**	.03	
Social expectation - negative	-.01	-.03	.06	-.78**

\*p < .05. \*\*p < .01.

## Appendix C

*Summary of Simultaneous Linear Regression Analyses for Cumulative Risk and Child Characteristics Predicting the Separate Digit Span Tasks*

Variable	Digits forward ( <i>n</i> = 390)			Digits backward ( <i>n</i> = 379)		
	<i>B</i>	<i>SE B</i>	$\beta$	<i>B</i>	<i>SE B</i>	$\beta$
Age in months	0.09	0.01	.57**	0.08	0.00	.69**
Sex	-0.10	0.19	-.02	-0.23	0.13	-.07 <sup>+</sup>
Language level	0.45	0.49	.04	-0.33	0.35	-.04
Cumulative Risk Index	-0.10	0.06	-.07	-.09	0.04	-.08*

*Note.*  $R^2 = .34$  for Digit span forwards;  $R^2 = .47$  for Digit span backwards. *SE B* refers to the standard error of *B*.

\* $p < .05$ , two-tailed. \*\* $p < .01$ , two-tailed. <sup>+</sup> $p < .05$ , one-tailed.

**Appendix D**

*Frequencies and Distributions of Outcome Variables*

	Boys ( <i>n</i> = 273)		Girls ( <i>n</i> = 306)		Total ( <i>N</i> = 579)	
<b>Dichotomous variables:</b>	<i>n</i>	(%)	<i>n</i>	(%)	<i>n</i>	(%)
<b>Best friend</b>						
Yes	171	(62.6)	210	(68.7)	381	(65.8)
No	21	(7.7)	27	(8.8)	48	(8.3)
Missing	81	(29.7)	69	(22.5)	150	(25.9)
<b>Positive SE</b>						
Yes	94	(34.4)	142	(46.4)	236	(40.8)
No	117	(42.9)	103	(33.7)	220	(38.0)
Missing	62	(22.7)	61	(19.9)	123	(21.2)
<b>Negative SE</b>						
Yes	86	(31.5)	76	(24.9)	162	(28.0)
No	125	(45.8)	169	(55.2)	294	(50.8)
Missing	62	(22.7)	61	(19.9)	123	(21.2)
	Boys ( <i>n</i> = 273)		Girls ( <i>n</i> = 306)		Total ( <i>N</i> = 579)	
<b>Continuous variables:</b>	Mean	<i>SD</i>	Mean	<i>SD</i>	Mean	<i>SD</i>
Theory of Mind	1.30	(0.79)	1.27	(0.81)	1.28	(0.80)
Digit span total	6.08	(3.44)	6.52	(3.63)	6.32	(3.55)
Digits forward	5.07	(2.19)	5.28	(2.32)	5.19	(2.26)
Digits backward	1.22	(1.62)	1.50	(1.66)	1.37	(1.64)



**Appendix E**

*Summary of Simultaneous Linear Regression Analyses for Individual Risk Variables Predicting the Separate Digit Span Tasks, Controlled for Child Characteristics*

Variable	Digits forward (n = 240)			Digits backward (n = 235)		
	B	SE B	β	B	SE B	β
Age in months	0.09	0.01	.55**	0.09	0.01	.70**
Sex	0.01	0.23	.00	-0.25	0.16	-.07
Language level	0.64	0.68	.05	-0.41	0.49	-.04
Mother's age at birth	-0.01	0.03	-.02	0.03	0.02	.07
Family status	-0.29	0.56	-.03	0.15	0.38	.02
Sibship size	0.10	0.16	.03	-0.08	0.11	-.04
Family functioning	0.04	0.05	.05	0.03	0.04	.05
Psychological health of caregiver	-0.08	0.05	-.09	-0.03	0.04	-.05
Frequency of drinking	0.15	0.13	.07	0.03	0.09	.02
Amount of alcohol	0.44	0.16	.16**	-0.04	0.11	-.02
Drinking as source of problems	0.48	0.61	.05	-0.55	0.42	-.07
Mother's education level	0.23	0.11	.13*	0.04	0.08	.03
Father's education level	-0.05	0.11	-.03	0.07	0.08	.05
Mother's income	0.06	0.14	.03	0.17	0.10	.10+
Father's income	0.38	0.11	.20**	0.03	0.08	.02
Mother's employment	0.31	0.33	.05	0.10	0.23	.02
Father's employment	0.02	0.56	.00	0.22	0.38	.03

Note.  $R^2 = .40$  for Digit span forward;  $R^2 = .51$  for Digit span backward. SE B refers to the standard error of B.

\* $p < .05$ , two-tailed. \*\* $p < .01$ , two-tailed. + $p < .05$ , one-tailed.