Development and Aging

Parental socioeconomic status and child intellectual functioning in a Norwegian sample

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Socioeconomic status (SES) in childhood has been linked to cognitive function and future academic and occupational success in studies from several countries. However, previous Nordic studies have shown inconsistent results regarding the strength of this link. We therefore investigated the association between SES and cognitive functioning in a sample of 255 Norwegian children, including 151 typically developing children and 104 children with a psychiatric diagnosis. The third edition of the Wechsler Intelligence Scale for Children (WISC-III) to assess cognitive function was used. SES was defined from maternal and paternal education and family income of typically developing children and of a subsample of children with a psychiatric diagnosis. Multiple adjusted regression analyses were used to investigate the relation between SES and cognitive functioning. The analyses showed that SES explained a significant part of the variance of the full-scale WISC-III score and two WISC-III indices (Verbal Comprehension and Freedom from Distractibility). Overall, the strength of the relations was weaker than expected from reports from other non-Nordic countries. Parental education was the only significant individual predictor, suggesting that income was of minor importance as a predictor of cognitive functioning. Further studies should investigate how diverse political and socioeconomic contexts influence the relation between SES and cognitive functioning.

Key words: Socioeconomic status, SES, intelligence, IQ, cognition, Nordic welfare model.

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INTRODUCTION

Socioeconomic status (SES) is a multidimensional construct typically indexed by education, income and/or occupation (Bradley & Corwyn, 2002). SES has been linked to many aspects of child development, including functional and structural brain development (Hackman, Farah & Meaney, 2010; Raizada & Kishiyama, 2010), academic achievement (Brooks-Gunn & Duncan, 1997) and physical and mental health (Adler & Ostrove, 1999; Bøe, Øverland, Lundervold & Hysing, 2012). The relation between SES and cognition is a long-standing area of research in developmental psychology, with studies including broad measures such as school achievement (e.g., Sirin, 2005) as well as studies including measures of specific aspects of cognitive function (e.g., Noble, McCandliss & Farah, 2007). An influential meta-analysis by White (1982), mainly based on samples from the US, reported that SES is related to both intellectual function (IQ) and school achievement. White (1982) also showed how operationalization of SES, achievement and IQ have varied across studies. This hinders direct comparison of results across studies, as differences in findings could be partly attributed to differences in operationalization of core variables.

Several studies exploring the relation between SES and cognitive function have used validated measures with good psychometric properties and norms (e.g., standardized tests of intelligence). In a longitudinal study (Gottfried, Gottfried, Bathurst, Guerin & Parramore, 2003), researchers found that maternal and paternal education explained 16% of the variance in IQ at 8 and 12 years of age, and this finding remained stable at age 17. Santos, Assis, Bastos *et al*. (2008) assessed children aged 5 in northeastern Brazil using the Wechsler Preschool and Primary Scale of Intelligence (WPPSI). Their SES variable (including information about family purchasing power, mother's schooling and father-child contact) explained 20% of the variance in the WPPSI score. An adoption study by Capron and Duyme (1989) found that the SES of adoptive parents accounted for a difference of 11.6 IQ points favoring children adopted by high SES parents. The SES of biological parents in this sample accounted for a difference of 15.5 IQ points, again favoring children in high SES families, but no interaction effect between biological and adoptive parents' SES was found. Another study found that both poverty and low parental education were associated with lower levels of IQ later in childhood (Duncan, Brooks-Gunn & Klebanov, 1994). Reports investigating specific cognitive functions have shown moderate relations between higher SES and better language composite scores in samples of kindergarteners (Noble, Norman & Farah, 2005), first-graders (Noble *et al*., 2007) and girls between the ages of 10 and 13 (Farah, Shera, Savage *et al*., 2006). These studies also found a weaker, but significant, relation between SES and visuospatial abilities and working memory (Farah *et al*., 2006; Noble *et al*., 2005, 2007). Finally, representative population data from British children born during a period in the 1970s showed that not only did the cognitive scores of low SES children at age 5 predict lower scores at age 10, it also predicted future unemployment, lower income and other indicators of low adult SES (Feinstein & Bynner, 2004). Summarizing the importance of SES in relation to

cognition, Gottfried and collaborators (2003, p. 204) wrote: "one can hardly think of any other variable that is so central in the course of human psychological development."

Effects of SES on cognitive functioning in Nordic samples

In a study of Danish children, Osler, Avlund and Mortensen (2013) found that fathers' social class predicted 7–8% of the variance in cognitive functioning. Kaplan, Turrell, Lynch, Everson, Helkala and Salonen (2001) found a significant relation with a moderate effect size between parental education and cognitive functioning in a study conducted in Finland. However, both studies included cohorts born in the mid-20th century, a time when the welfare models and socioeconomic contexts were different from today. A study of a younger Swedish cohort conducted by Andersson, Sommerfelt, Sonnander and Ahlsten (1996) found a significant relation between maternal socioeconomic status and verbal IQ in both young boys and girls. They controlled for the IQ of the mother, which explained 3% of the variance in their children's IQ. The authors also reported a significant relation between mother's SES and performance IQ for boys. In yet another study (Smith, Fagan & Ulvund, 2002), children born in Norway during a 4-year period from 1985 to 1989 were assessed at 8 years of age using the Stanford-Binet Intelligence Scale (SB:FE) and Kaufman Assessment Battery for Children (K-ABC), yielding significant correlations between SES and SB:FE, and SES and K-ABC. However, the sample in this study included only children with low birth weight, and the results may therefore not be generalized to the population. Although there seems to be less social inequality in Scandinavian countries (OECD, 2008), associations between SES and cognitive abilities are still found. Summing up the evidence so far, there seems to be smaller effect sizes for the association between SES and cogniton in Nordic studies than in studies from other countries, but the findings are by no means conclusive.

Socioeconomic status and mental health

There is evidence for a strong association between low SES and poor mental health, including psychiatric disturbance, poor social functioning, depression and delinquent behavior (Bradley & Corwyn, 2002). This relation has also been reported in a Norwegian study, where poor family economy was found to be a strong SES predictor of mental health problems and higher probability of a psychiatric diagnosis (Bøe *et al.*, 2012). Furthermore, reduced cognitive functioning is common in children with mental disorders, as reflected in findings of low IQ and executive dysfunction in studies of children with Attention Deficit Hyperactivity Disorder (ADHD) and Tourette syndrome (TS) (see e.g., Frazier, Demaree & Youngstrom, 2004; Rasmussen, Soleimani, Carroll & Hodlevskyy, 2009). These diagnoses are also shown to be more common in low than high SES families (Miller, Scharf, Mathews & Ben-Shlomo, 2014; Willcutt, 2012). However, the question of whether SES matters more or less in children with mental disorders have not been thoroughly investigated (Bradley & Corwyn, 2002).

The present study

The aim of the present study was to further investigate the relation between SES and cognitive functioning in a Norwegian sample of 255 eight to twelve-year-old children. Maternal and paternal education and family income were included as SES measures, and performance on the third edition of the Wechsler Intelligence Scale for Children (WISC-III) as a measure of cognitive function. The sample included children with a child psychiatric diagnosis, identified through a clinical interview (the Schedule for Affective Disorders and Schizophrenia for School Aged Children, Present and Lifetime Version; K-SADS-PL, Kaufman, Birmaher, Brent *et al.*, 1997). From previous studies, we expected to find a strong relation between SES and IQ. The strength of the relation was expected to be somewhat lower than the ones reported in studies from non-Nordic countries, and the relation was expected to be stronger in the subsample with than without a child psychiatric diagnosis. This study is the first Scandinavian study to compare the relation between parental SES and cognitive function in a sample recruited from a community sample including children with and without a psychiatric diagnosis.

METHOD

Participants

The present study is part of the Bergen Child study (BCS), a multi-wave longitudinal population-based study of children's development and mental health. The first wave of the BCS recruited all children in the 1993–1995 cohort in the municipality of Bergen (N = 9,430) and included three stages (Heiervang, Stormark, Lundervold *et al.*, 2007). The first stage collected questionnaire data from parents and teachers, including reports on the Strengths and Difficulties Questionnaire (SDQ; Goodman, 1999). In stage two, all parents (N = 1,424) of those identified as screen positive (determined by scores on the questionnaire administered in stage one), and a random sample of screen negative (N = 754) identified in the first stage were invited to take part in a clinical interview, Development and Well-Being Assessment (DAWBA; Goodman, Ford, Richards, Gatward & Meltzer, 2000), with a participation rate of 44%. Information about parental education and family income was collected as part of the interview. A third stage included all children diagnosed according to the DAWBA in the second stage together with an equal number of children without a diagnosis (N = 421). A total of 329 children completed a battery of cognitive tests, including the official Norwegian translation of the third edition of Wechsler Intelligence Scale for Children (WISC-III; Wechsler, 1991), as well as a clinical interview using the Schedule for Affective Disorders and Schizophrenia for School Aged Children, Present and Lifetime Version (K-SADS, Kaufman *et al.*, 1997). The present study included all who accepted the invitation and had complete data on SES, WISC-III and diagnostic status (N = 255; 37% girls). One hundred four children were categorized as diagnose positives and 151 children as diagnose negatives according to K-SADS (see details below). The children's age ranged from 7.77 to 11.98 years (*M* = 9.89, *SD* = 0.96). See Lundervold, Posserud, Ullebø, Sorensen and Gillberg (2011) for more information about a similar selection procedure from the first to the third stage. The Regional Committee for Medical and Health Research Ethics in Western Norway approved the study.

Measures

Socioeconomic status. As part of the DAWBA interview in the second stage of the first wave of BCS, the parents reported their educational level and household income. Options for education were: Compulsory

education (< 11 years); additional technical qualification/vocational high school studies (2–3 additional years); additional academic qualification/ theoretical high school studies (2–3 additional years); up to 4 years at college/university; more than 4 years at college/university. Household income was converted to United States Dollars and adjusted for national differences in purchasing power parity using the World Bank's conversion factors for 2000–2004 (World Bank, 2015). Participants reported it per annum as approximately: (1) below 100K NOK ($10K); (2) 100–200K NOK ($10–20K); (3) 200–400K NOK ($20–41K); (4) 400–600K NOK ($41–61K); (5) 600–800K NOK ($61–82K) or (6) above 800K NOK ($82K).

Cognitive function. WISC-III (Wechsler, 1991) is a standardized test of intelligence, translated to Norwegian (Eilertsen & Johnsen, 2003) and scored according to Swedish norms (Sonnander, Ramund & Smedler, 1998). Test technicians with extensive experience and training administered and scored performance on WISC-III. In order to investigate the relation between SES and specific cognitive domains, analyses were restricted to full scale IQ (FSIQ) and the sub-indices of Verbal Comprehension (VCI), Perceptual Organization (POI), Freedom from Distractibility (FFDI), Processing Speed (PSI), as these sub-indices are expected to show greater specificity compared to the Verbal and Performance scales (Wechsler, 1991).

Diagnostic information. K-SADS is a semi-structured interview generating DSM-IV diagnoses in children aged 6 to 18 years (Kaufman *et al.*, 1997). Studies have shown sufficient reliability and validity for the K-SADS (Birmaher, Ehmann, Axelson *et al.*, 2009; Kaufman *et al.*, 1997), although some researchers have pointed to the need for more validation data (Ambrosini, 2000). In the current study, the K-SADS generated mental health diagnoses in 104 of the 255 children. The most common diagnoses were ADHD (35 participants), specific phobias (32), enuresis/encopresis (26), tics (18), Oppositional Defiant Disorder (ODD, 19), TS (10), and social anxiety disorder (10).

Statistical analyses

All statistical analyses were performed with IBM SPSS Statistics version 22 for Windows (Armonk, NY: IBM). Clinical and non-clinical children were compared on age, sex, WISC index scores and SES using t- and chi-square tests. We then employed hierarchical regression analyses, where each of the WISC-III indices and full scale IQ were entered as dependent variables in separate analyses. The child's age at testing, sex and diagnostic status (meeting versus not meeting diagnostic criteria for a mental disorder) were entered in the first step and maternal education, paternal education and household income in the second step. To probe the relation of SES in children with or without mental disorders, post-hoc moderation analyses were performed. Here, significant SES indicators from the respective regressions and diagnostic status were entered as independent variables, along with their interaction term. Age, sex, and non-significant SES indicators from the regression analysis were entered as covariates. All moderation analyses were performed using Hayes' SPSS macro (Hayes, 2013). Bias-corrected and accelerated (BcA) bootstrapping with 10,000 resamples was used to obtain confidence intervals and reduce the influence of bias from non-normality and heterogeneity (Efron, 1987; Wilcox, 2012). Models including centered quadratic interaction terms for the SES indicators were also evaluated, but were discarded as they did not significantly improve the model fit.

RESULTS

Table 1 presents the demographic characteristics and the WISC-III results. For maternal and paternal education, the majority reported education levels beyond high school (56% and 52%, respectively), and 28% reported income among the three lowest categories. There were more males than females with a diagnosis (69% vs 53%, $\chi^2 = 6.08$, $p = 0.01$). T-tests showed that children with mental health disorders scored significantly lower on FSIQ

Table 1. *Summary of descriptive data for SES and WISC-III across genders (Total N = 255)*

	Total sample N (%)	161 Males N (%)	94 females N (%)
Maternal education			
Basic	13 (5%)	9 (5%)	4 (4%)
High school vocational	31 (12%)	18 (11%)	13 (14%)
High school theoretical	68 (27%)	45 (28%)	23 (24%)
College/University, up to 4 years	91 (36%)	52 (32%)	39 (41%)
College/University, over 4 years	52 (20%)	37 (23%)	15 (16%)
Paternal education			
Basic	21 (8%)	11 (7%)	10 (10%)
High school vocational	75 (29%)	52 (32%)	23 (24%)
High school theoretical	27 (11%)	14 (9%)	13 (14%)
College/University, up to 4 years	73 (29%)	45 (28%)	28 (30%)
College/University, over 4 years	59 (23%)	39 (24%)	20 (21%)
Gross household income			
< $10 K	3 (1%)	3 (2%)	0 (0%)
$10k–20k	18 (7%)	12 (7%)	6 (6%)
$20–41k	49 (20%)	32 (20%)	19 (20%)
$41k–61k	72 (29%)	45 (28%)	29 (20%)
$61k–82k	77 (31%)	47 (29%)	33 (35%)
> $82K	27 (11%)	22 (14%)	7 (7%)
WISC-III index scores	M (SD), range total	M (SD), range	M (SD), range
FSIQ	93.95 (12.10), 70–126	93.18 (12.38), 71–125	95.28 (11.54), 70–126
VCI	92.93 (12.46), 65–135	93.07 (12.87), 65–135	92.67 (11.81), 68–118
POI	97.98 (12.95), 66–131	97.27 (12.61), 69–127	99.18 (13.50), 66–131
FFDI	95.56 (15.01), 48–155	94.08 (16.10), 48–155	98.10 (12.60), 66–128
PSI	94.11 (16.27), 50–138	90.20 (14.91), 50–129	100.79 (16.40), 62–138

Notes: FSIQ = Full scale intelligence quotient; VCI = verbal comprehension index; POI = perceptual organization index; FFDI = freedom from distractibility index; PSI = processing speed index.

(t(253) = 2.35, p = 0.02, mean difference = –4.55) and VCI (t(253) = 2.65, p = 0.008, mean difference = –4.77). These children also had fathers with lower education levels (t(253) = 2.44, p = 0.02, mean difference = –0.41) and lower household income (t(253) = 2.34, p = 0.03, mean difference = –0.33).

SES accounted for a significant part of the variance in FSIQ, VCI and FFDI, above that of sex, age and diagnostic status. SES accounted for 6.4% of the variance in FSIQ (total model F[6, 248] = 4 .07, p = 0.01), 8.8% of VCI (total model F[6, 248] = 5.51, p < 0.001), and 8.3% of FFDI (total model F[6, 248] = 7.71, p < 0.01), while SES ΔR^2 for POI and PSI were not statistically significant. A more detailed inspection of each SES predictor showed that maternal education significantly predicted FSIQ (B = 2.11, p = 0.01), VCI (B = 1.59, p < 0.001) and FFDI (B = 0.66, p = 0.012), while paternal education significantly predicted FFDI (B = 0.61, p = 0.013). Family income did not significantly predict any WISC-III index. The results are summarized in Table 2 and illustrated in Fig. 1.

Moderation analyses did not show any significant interaction between SES and diagnostic status for any cognitive index (all ps > 0.2 and 95% CIs including zero). This indicated that the relation between SES and cognitive functioning was stable across children with and without diagnosable mental disorders. Visual and statistical inspections (using Levene's test for equality of variances) of the distribution of SES levels for healthy and diagnosable children further showed that this was not explained by a restriction of range or variance in SES or in WISC indices.

DISCUSSION

The current study investigated the relation between SES and cognitive functioning in a sample of Norwegian children aged 8–12 years. The results showed that SES was related to the full scale WISC-III performance, and performance on the VCI and FFDI indices. The strongest association was found between SES and verbal functioning. Paternal and maternal education were the only significant SES predictors, suggesting that income is less important in our sample than expected from previous studies from other countries.

How do different socioeconomic variables relate to cognitive function?

The present results showed that maternal education was more closely related to VCI performance than paternal education and income. This has been explained by the time mothers tend to spend on interacting with their young children (Craig, 2006). This is in line with a study by Hoff (2003), reporting a positive correlation between SES and the child's productive vocabulary, which was most likely mediated by the mean length of utterances in the maternal speech. In addition, Huttenlocher, Vasilyeva, Cymerman and Levine (2002) found a correlation between SES and complexity in sentences uttered by children, and concluded that the relation was most likely mediated by the complexity in maternal sentences. Raviv, Kessenich and Morrison (2004) conducted a study of the particular mediators that influence the relation between SES and language skills, and found maternal sensitivity and cognitive stimulation as significant partial

Table 2. *Summary of multiple regression analyses for variables predicting cognition (N = 255)*

Dependent variables	SES ΔR^2	Maternal education		Paternal education		Household income		Diagnosis		Sex		Age	
		B	95% CI	B	95% CI	B	95% CI	B	95% CI	B	95% CI	B	95% CI
FSIQ	**0.064****	**2.11****	0.509, 3.680	1.02	–0.492, 2.534	1.35	–0.572, 3.070	–2.92	–6.71, 0.953	2.48	–1.204, 6.030	–0.02	–1.852, 1.877
VCI	**0.088*****	**1.59*****	0.806, 2.364	0.76	–0.109, 1.422	0.43	–0.652, 1.374	**2.12***	4.114, –0.025	–0.46	–2.437, 1.474	0.17	–.803, 1.270
POI	0.007	0.39	–0.475, 1.285	–0.21	–1.036, 0.610	0.37	–0.535, 1.261	–0.64	–2.714, 1.478	1.16	–0.882, 3.228	0.37	–0.522, 1.280
FFDI	**0.083*****	**0.67****	0.157, 1.183	**0.62****	0.129, 1.094	0.23	–0.328, 0.797	–0.33	–1.521, 0.900	**1.14***	0.016, 2.264	**–1.19*****	–1.755, –0.641
PSI	0.011	–0.05	–0.750, 0.624	0.34	–0.221, 0.929	0.28	–0.361, 0.845	–0.56	–1.987, 0.889	**3.48*****	2.049, 4.982	–0.23	–0.906, 0.450

Notes: *p ≤ 0.05; **p ≤ 0.01; ***p ≤ 0.001; FSIQ = Full scale intelligence quotient; VCI = verbal comprehension index; POI = perceptual organization index; FFDI = freedom from distractibility index; PSI = processing speed index. All predictors with a significant relation are bolded.
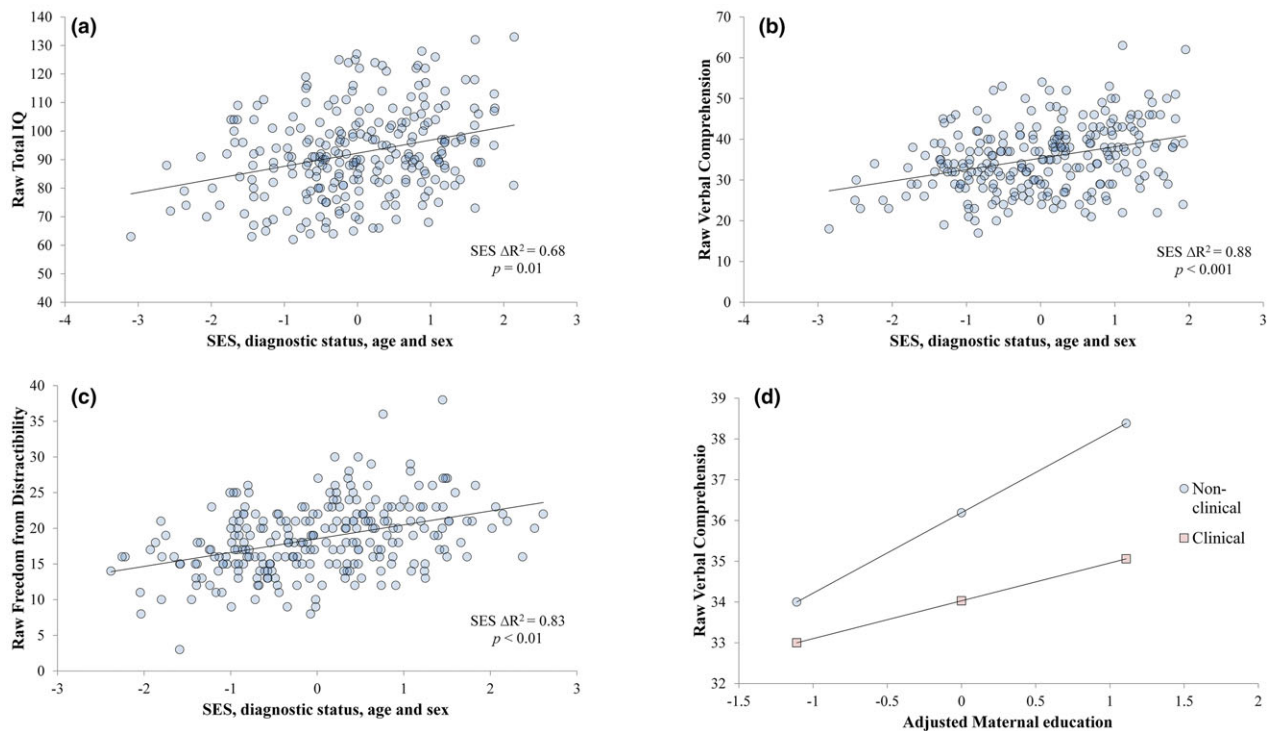
Fig. 1. Panels show scatterplots of final regression models where SES significantly predicted (a) full scale IQ, (b) the Verbal Comprehension, and (c) Freedom for distractibility indicies. Panel d shows similar beta coefficients of maternal education for Verbal Comprehension index for the two subsamples.

mediators for verbal comprehension, expressive language and receptive verbal conceptual abilities. We suspect that these maternal mediators could be among the underlying factors for our findings on the relation between SES and verbal performance.

SES predicted individual differences in FFDI to nearly the same degree as for VCI, indicating that the influence of SES is not restricted to what is commonly referred to as crystallized intelligence. Both maternal and paternal education were significant. Their shared role could be a result of FFDI's stronger relation to fluid intelligence and genetic factors, where both maternal and paternal heritability plays a role (Davies, Tenesa, Payton *et al.*, 2011). However, given the small difference between the estimated coefficients for paternal education, it is possible that the different levels of importance of mother's and father's education are a statistical artifact rather than a meaningful difference.

The non-significant contribution of income on cognitive function are in line with results from a study by Gershoff, Aber, Raver & Lennon (2007), reporting that household income only influences cognitive abilities when the family experiences material hardship and the parents are unable to invest in a cognitively stimulating environment. However, the political system of Scandinavian countries, characterized as social democratic and built around the Nordic welfare model, strives towards an even (re)distribution of resources and reduced economic inequality (Arts & Gelissen, 2002; Esping-Andersen, 1990). The provided welfare intends to prevent economic and developmental deprivation in poor families and promote class mobility, for example, by having unemployment benefits which are comparable to normal income (OECD, 2008). This may explain why there are less socioeconomic differences and less relative poverty in the Nordic

countries compared to in the US or UK (OECD, 2008, 2011). It is thus possible that the relatively higher and more homogenous levels of SES in a Norwegian context creates a ceiling effect, where the positive influence of SES on cognitive development leads to an increased contribution of other factors (for example heritability), beyond that of poverty or stress over material needs (Turkheimer, Haley, Waldron, D'Onofrio & Gottesman, 2003).

Previous studies in Nordic samples have reported that SES explains cognitive functioning in the range of 3% to 30%. Our findings lie in the lower portion of this range, from 6.4% (FSIQ) to 8.8% (VCI). Importantly, both sample characteristics and the method of measuring cognitive functioning may influence the differences in the strength of the relation. When comparing our findings to three recent high quality studies performed in the US (Farah *et al.*, 2006; Noble *et al.*, 2005, 2007), we found that SES explains considerably less variance in verbal functioning, but at a similar level for freedom from distractibility (8.3%). One reason for this could be that the relation between SES and a more fluent part of intellectual function is relatively more dependent on genetics than external stimulation, while environmental factors are more important than genetics for verbal comprehension (Rindermann, Flores-Mendoza & Mansur-Alves, 2010).

How do SES and IQ relate to mental health?

Our post hoc analysis revealed that SES appeared to be similarly related to IQ in both the clinical and non-clinical subsamples, and we did not find any differences in range or variance for SES or IQ variables between these two groups. Consistent with previous findings (Frazier *et al.*, 2004; Kusche, Cook & Greenberg, 1993; Rasmussen *et al.*, 2009), the clinical sample on average scored

lower on some IQ indices and on all SES indicators than their peers who did not meet diagnostic criteria. This could imply a similar role of SES for cognitive functioning in these two groups, even though mental disorders were related to a lower mean level of SES.

The complex question of cause and effect

SES and cognitive development reciprocally influence each other over the lifespan, and interact not only with parental SES during childhood, but also with several other variables in the surrounding environment (Evans, 2004). The relation between SES and IQ in childhood (e.g., Duncan *et al.*, 1994; Gottfried *et al.*, 2003; Santos *et al.*, 2008) could be explained by social causation, where factors that accompany different levels of SES (for example nutrition, stress and cognitive stimulation) affect brain development. However, it could also reflect social selection, where parents with high cognitive functioning tend to achieve high SES and subsequently provide a better, more stimulating environment for their children (Huston & Bentley, 2010; Strenze, 2007). Finally, there is emerging evidence for an interactionist perspective; childhood SES influences cognitive functioning, personality characteristics and the development of one's adult SES, and these characteristics, as well as the family stress process influence the development of one's children (Conger & Donnellan, 2007). This complex cycle, moreover, is susceptible to other factors, such as economic downfall or positive changes in income in a family (Hackman *et al.*, 2010).

Limitations

One limitation concerns the inclusion of several different diagnostic groups into one clinical group. However, a detailed analysis of groups' mental disorders and how they relate to cognitive functioning and SES is outside the scope of our aims. Instead, we were able to show that parental SES appears to be as important for child cognitive functioning across the broad dichotomy of children meeting or not meeting criteria for a mental disorder using a semi-structured clinical interview. Second, assessment of cognitive function was restricted to the WISC-III. Future studies should include a larger battery of neuropsychological tests and potentially also a samples that are more diverse in terms of diagnostic status and level of SES to investigate the stability across cognitive domains and socioeconomic contexts.

CONCLUSION AND IMPLICATIONS

We found an association between SES and cognitive functioning, in which SES to a greater degree predicted VCI and FFDI than other indices. Notably, the amount of explained variance lies in the lower range compared to previous studies from other populations, except for FFDI, where our results were similar to those obtained previously. The role of maternal and paternal education differ somewhat for specific cognitive indices. The multiple pathways through which SES might influence cognitive development deserve increased attention, such as integration of social causation and social selection (Hackman *et al.*, 2010). In addition, how different contexts affect the importance of these pathways is still largely uninvestigated, and new findings could contribute to interventions aimed at alleviating poorer cognitive development in low SES families.

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