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Short communication

The interaction between school poverty and agreeableness in predicting educational attainment

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ABSTRACT

This study examined the relation between school poverty and educational attainment of adolescents, and tested whether personality trait agreeableness moderated this link. The sample consisted of 4236 adolescents, whose math abilities were assessed twice, at ages around 13/14 and 15/16. Agreeableness was assessed at age 13. School poverty was measured as the proportion of children eligible for free school meals in the school. The results showed a negative relation between school poverty and educational attainment, however, this negative relation was weaker for adolescents with higher levels of agreeableness. Specifically, in low poverty schools, agreeableness did not predict differences in educational attainment. The results were in line with the diathesis-stress model. This suggests that higher levels of agreeableness can contribute to resilience and better coping with contextual stressors in the school environment.

1. Introduction

Many studies have linked contextual poverty in general and school poverty specifically to educational outcomes of individuals (Lacour & Tissington, 2011; Nieuwenhuis & Hooimeijer, 2016; Nieuwenhuis, Hooimeijer, van Dorsselaer, & Vollebergh, 2013; Portes & MacLeod, 1996). School poverty is negatively related to parental education. Therefore, the social networks within low SES schools consist of lower educated parents, and through these networks, less social capital is available, such as information about after-school programs. Furthermore, parents may not value or understand the benefits of formal education, resulting in students who are less prepared for education (Lacour & Tissington, 2011). Finally, higher poverty schools were found to have less qualified teachers on staff (Peske & Haycock, 2006). This suggests that low SES schools have fewer positive role models showing the benefits and transferring the importance of education. Because positive socialisation mechanisms are not in place in low SES schools, children may become less inclined to perform well.

However, educational attainment is not uniform for all children in the same school, some perform better than others. This variation may be induced by differences in resilience, as described by the diathesis-stress model. Low SES schools can be experienced as stressful environments, however, some are better able to cope with environmental stressors than others (Magnusson & Stattin, 2006). Personality traits have been shown to be related to better coping with stressful environments (O'Brien & DeLongis, 1996), such as school poverty. In this case, resilient adolescents are expected to be affected less by school

poverty than non-resilient adolescents. In high SES schools they are expected not to differ. Alternatively, the differential susceptibility model predicts that adolescents who are more malleable are more likely to be negatively affected by stressful environments than less malleable adolescents, but also more likely to be positively affected by positive environments (Belsky & Pluess, 2009). In this case, less malleable adolescents are expected not to be affected by the level of school poverty, while malleable adolescents are expected to have better educational outcomes in high SES schools and worse outcomes in low SES schools.

Specifically, I have examined the moderating role of agreeableness, a personality trait that is related to being forgiving, patient, warm, considerate, and sympathetic (Goldberg, 1992). Agreeableness has been linked to lower levels of criminal behaviour and higher levels of community involvement (Ozer & Benet-Martinez, 2006; Roberts, Kuncel, Shiner, Caspi, & Goldberg, 2007). This suggests that adolescents with higher levels of agreeableness are less inclined to interact with deviant peers, and more likely to be involved in positive institutions at school, such as clubs or committees. Adolescents with lower levels of agreeableness are more inclined to participate in antisocial behaviour, which may be amplified in a stressful school environment. When adolescents do not function as expected in school, and the school does not foster their positive development, they may focus their attention towards other activities or deviant peer groups, where status attainment is reached through violent behaviour and anti-school attitudes (Ellis et al., 2012; Willis, 1977). For this follows that agreeableness could contribute to adolescents' resilience or malleability in the school

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environment.

Both the diathesis-stress and differential susceptibility models lead to the following hypothesis: The relation between school poverty and educational achievement is moderated by agreeableness such that this relationship will be weaker for adolescents with higher levels of agreeableness (H1). Both models predict that in high poverty schools, adolescents with low agreeableness do worse, however, in low poverty schools they lead to two competing hypotheses. From diathesis-stress follows: In low poverty schools, adolescents with high levels of agreeableness do not differ from adolescents with low levels of agreeableness in their educational attainment (H2a). From differential susceptibility follows: In low poverty schools, adolescents with high levels of agreeableness have lower educational attainment than adolescents with low levels of agreeableness (H2b).

2. Method

2.1. Participants

Participants were 4236 adolescents (52% females) from the Avon Longitudinal Study of Parents and Children (ALSPAC; initial recruitment: 14,541 pregnant women with expected delivery dates between 1991/04/01–1992/12/31; total sample: 15,458 fetuses, of which 14,701 were alive at age 1; Boyd et al., 2013). Adolescents' math abilities were assessed twice, at ages around 13/14 and 15/16, resulting in 6813 observations. Students were nested in 336 schools, mostly in the south-west of England. Please note that the study website contains details of all the data that is available through a fully searchable data dictionary (<http://www.bris.ac.uk/alspac/researchers/data-access/data-dictionary/>).

2.2. Measures

2.2.1. Educational attainment

Math scores on the standardised tests Key Stage 3 (age 13/14) and Key Stage 4 (age 15/16) were obtained from the National Pupil Database. The scales of the two scores were different, and were transformed for comparability using the proportion of maximum scaling (POMS; Little, 2013). This transformation retains the rank-order of individuals, while avoiding measuring mean-level changes. The formula used was $POMS = (\text{observed} - \text{minimum}) / (\text{maximum} - \text{minimum})$ (Moeller, 2015). For descriptive statistics and correlations of all variables, see Tables 1 and 2, respectively.

2.2.2. Agreeableness

Using the International Personality Item Pool (Goldberg, 1992), the Big Five personality trait agreeableness was assessed at 13 years and 6 months. Adolescents were presented with 10 statements, and were asked how well these statements described them on a 5-point answering scale. Cronbach's alpha: 0.72. Agreeableness was centred.

2.2.3. School poverty

The proportion of children in the school who were eligible for free school meals was used as a proxy for school poverty. This is a heavily

Table 1
Descriptive statistics (N = 6813).

| | Mean | S.D. | Min. | Max. |
|--------------------------|--------|-------|-------|------|
| Educational attainment | 0.590 | 0.152 | 0 | 1 |
| School poverty | -0.186 | 0.818 | -1.13 | 9.31 |
| Agreeableness | 0.765 | 0.522 | -2 | 2 |
| Sex (1 = female) | 0.516 | 0.500 | 0 | 1 |
| Parental education | 2.167 | 1.121 | 0 | 4 |
| Race (1 = non-white) | 0.037 | 0.188 | 0 | 1 |
| Mother's age at delivery | 28.962 | 4.383 | 16 | 44 |

studied measure of school poverty, and considered a good indicator (Gorard, 2012). The measure was assessed for both the schools adolescents attended at the two Key Stages. These data were obtained from the Annual School Census. The measure was standardised with 0 as mean and standard deviation 1 to make the interaction term easier to interpret.

Control variables. First, sex was measured as female (1) and male (0). Second, parental education was measured as the average of the highest attained education of both parents. Education consisted of five categories: 0) (General) Certificate of Secondary Education ([G]CSE) levels D, E, F, or G; 1) vocational; 2) Ordinary Level (O Level) or GCSE levels A, B, or C; 3) Advanced Level (A Level); and 4) university degree. Third, race was measured as non-white (1) and white (0). Fourth, mother's age at delivery was measured as mother's age in years at the birth of the respondent (ranging from 16 to 44).

2.3. Analyses

To test the hypotheses, I used multilevel random-effects regression models, with time nested in individuals, nested in schools adolescents attended at the time of Key Stage 3. I created an interaction term composed of the cross-product of school poverty and agreeableness to test for moderation. The quadratic terms of school poverty and agreeableness were included to correct for the non-normality of the response variables. This corrects for spurious interaction effects (Lubinski & Humphreys, 1990). To control for changes in school environment, I ran a sensitivity analysis, restricting the sample to adolescents that did not change schools between Key Stage 3 and 4. This resulted in a reduced sample of 4020 (from 4236), indicating that most adolescents stayed in the same school. The results of the sensitivity analysis were the same, suggesting that changes in school environment did not play a role.

3. Results

Adolescents attended schools with different levels of poverty: the first quartile of the sample went to schools that ranged from 0% to 4.2% of children eligible for free school meals; the second quartile ranged from 4.2% to 6.5%; the third from 6.5% to 13.3%; and the fourth from 13.3% to 100% school meal eligibility. When examining Model 1 (Table 2), school poverty is indeed negatively related to educational attainment. Higher levels of agreeableness were related to higher educational attainment. The control variables show that parental education was positively related with adolescents' attainment.

Model 2 (Table 3) shows a positive interaction between school poverty and agreeableness. The interaction significantly improved the model fit. As predicted, higher levels of agreeableness were related to a weaker relation between school poverty and educational attainment. The interaction plot shows the same result (Fig 1): adolescent with low levels of agreeableness had a steeper slope for the relation between school poverty and educational attainment ($b = -0.069$; $p = 0.000$) than adolescents with high levels of agreeableness ($b = -0.017$; $p = 0.019$). Calculating the region of significance (with $\alpha = 0.05$; Preacher, Curran, & Bauer, 2006) showed that agreeableness did not relate to educational attainment in schools with a standardised proportion of children eligible for school meals lower than 2.1452 (where proportion of children eligible for school meals ranged from -1.13 to 9.31).

4. Discussion

This study showed that higher levels of school poverty were related to lower educational attainment. It is possible that the lack of positive role models and presence of peers from low-educated families results in a bad learning environment, where educational attainment is not valued and stimulated. Next, the relation between school poverty and educational attainment was buffered by personality trait agreeableness,

Table 2
Correlations (N = 6813).

| | 1. | 2. | 3. | 4. | 5. | 6. | 7. |
|-----------------------------|----|-----------|-----------|----------|-----------|----------|-----------|
| 1. Educational attainment | – | –0.245*** | 0.151*** | –0.020 | 0.354*** | –0.036** | 0.137*** |
| 2. School poverty | | – | –0.086*** | –0.026* | –0.240*** | 0.097*** | –0.118*** |
| 3. Agreeableness | | | – | 0.320*** | 0.152*** | –0.013 | 0.088*** |
| 4. Sex (1 = female) | | | | – | –0.005 | –0.001 | –0.015 |
| 5. Parental education | | | | | – | –0.030* | 0.296*** |
| 6. Race (1 = non-white) | | | | | | – | –0.021* |
| 7. Mother's age at delivery | | | | | | | – |

* p < 0.05.
** p < 0.01.
*** p < 0.001.

Table 3
Multilevel random-effects regression of educational attainment.

| | Model 1 B (S.E.) | Model 2 B (S.E.) |
|---|-------------------|-------------------|
| School poverty | –0.034 (0.005)*** | –0.043 (0.006)*** |
| School poverty ² | 0.005 (0.001)*** | 0.005 (0.001)*** |
| Agreeableness | 0.066 (0.008)*** | 0.066 (0.008)*** |
| Agreeableness ² | –0.024 (0.005)*** | –0.023 (0.005)*** |
| School poverty × agreeableness | | 0.013 (0.004)** |
| Sex (1 = female) | –0.020 (0.004)*** | –0.020 (0.004)*** |
| Parental education | 0.037 (0.002)*** | 0.037 (0.002)*** |
| Race (1 = non-white) | –0.008 (0.010) | –0.008 (0.010) |
| Mother's age at delivery | 0.000 (0.000) | 0.000 (0.000) |
| Intercept | 0.465 (0.014)*** | 0.465 (0.014)*** |
| School-level variance | 0.001 (0.000)*** | 0.001 (0.000)*** |
| Individual-level variance | 0.009 (0.000)*** | 0.009 (0.000)*** |
| Time-level variance | 0.010 (0.000)*** | 0.010 (0.000)*** |
| N schools | 336 | 336 |
| N individuals | 4236 | 4236 |
| N time | 6813 | 6813 |
| Log likelihood | 4217.343 | 4221.732 |
| Likelihood ratio test (chi ² (df)) | | 8.78 (1)** |

* p < 0.05.
** p < 0.01.
*** p < 0.001.

which is in support of hypothesis 1 (H1). This finding is in line with other studies examining the moderating role of personality for other contextual effects on educational attainment (Nieuwenhuis, Hooimeijer, & Meeus, 2015; Nieuwenhuis, Hooimeijer, van Ham, & Meeus, 2017). Next, the diathesis-stress model predicted that adolescents in low poverty schools would not have different educational attainment based on their level of agreeableness (H2a), while the differential susceptibility model predicted adolescents with low

agreeableness to be more malleable, and therefore do better in low poverty schools than adolescents with high agreeableness (H2b). The results showed that adolescents with different levels of agreeableness did not have different educational attainment in low poverty schools, which is in line with the diathesis-stress model (H2a). The findings suggest that higher levels of agreeableness contribute to resilience when faced with environmental stressors, such as school poverty. Lower levels of agreeableness contribute to more vulnerability under the same circumstances.

It is possible that children from lower educated families end up in schools with lower SES, which could indicate that lower SES schools contain lower attaining adolescents because they sort into these schools based on their socio-economic background. By controlling for parental education, I tried to (partly) overcome this problem. Also, restricting the sample to adolescents who did not move schools between the two measurement points yielded the same results. If the relation between school and attainment would have disappeared, this could suggest that scoring low on Key Stage 3 would have resulted in a move to a worse (lower SES) school, which would then have driven the effect of school poverty for the full sample. This was not the case, which indicates that sorting did not play a major role.

The results emphasise the importance of considering individual characteristics such as personality traits when assessing contextual predictors. School effects are not uniform, and have to be studied in tandem with the diversity of children who inhabit the school. This study could be used to identify adolescents who are particularly vulnerable to detrimental effects of school poverty.

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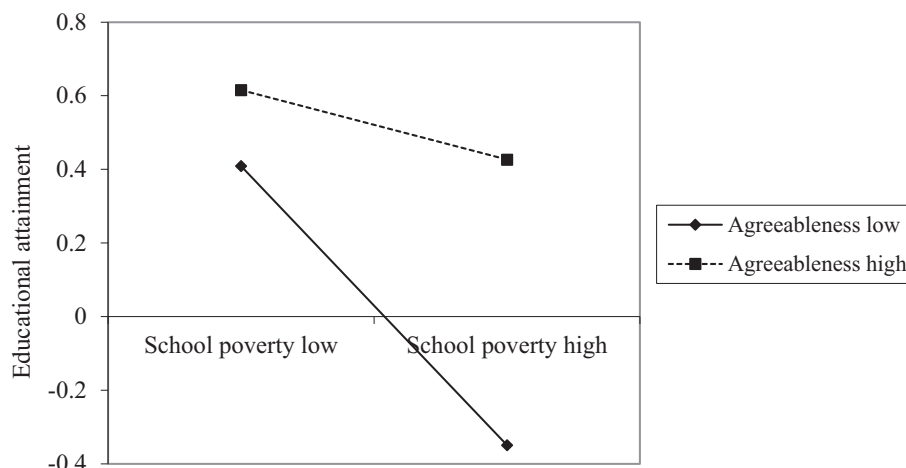


Fig. 1. Interaction plot between school poverty and agreeableness, predicting educational attainment.

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Ethical approval

Ethical approval for the study was obtained from the ALSPAC Ethics and Law Committee and the Local Research Ethics Committees.

References

- Belsky, J., & Pluess, M. (2009). Beyond diathesis stress: Differential susceptibility to environmental influences. *Psychological Bulletin*, *135*(6), 885–908.
- Boyd, A., Golding, J., Macleod, J., Lawlor, D. A., Fraser, A., Henderson, J., Molloy, L., et al. (2013). Cohort profile: The 'children of the 90s'—the index offspring of the Avon Longitudinal Study of Parents and Children. *International Journal of Epidemiology*, *42*(1), 111–127.
- Ellis, B. J., Del Giudice, M., Dishion, T. J., Figueredo, A. J., Gray, P., Griskevicius, V., Hawley, P. H., et al. (2012). The evolutionary basis of risky adolescent behavior: Implications for science, policy, and practice. *Developmental Psychology*, *48*(3), 598–623.
- Goldberg, L. R. (1992). The development of markers for the big-five factor structure. *Psychological Assessment*, *4*, 26–42.
- Gorard, S. (2012). Who is eligible for free school meals? Characterising free school meals as a measure of disadvantage in England. *British Educational Research Journal*, *38*(6), 1003–1017.
- Lacour, M., & Tissington, L. D. (2011). The effects of poverty on academic achievement. *Educational Research Review*, *6*(7), 522–527.
- Little, T. D. (2013). *Longitudinal structural equation modelling*. New York, NY: The Guilford Press.
- Lubinski, D., & Humphreys, L. G. (1990). Assessing spurious "moderator effects": Illustrated substantively with the hypothesized ("synergistic") relation between spatial visualization and mathematical ability. *Psychological Bulletin*, *107*, 358–393.
- Magnusson, D., & Stattin, H. (2006). The person in context: A holistic–interactionistic approach. In R. M. Lerner, & W. Damon (Eds.). *Theoretical models of human development* (pp. 400–464). Mahwah, NJ: Wiley.
- Moeller, J. (2015). A word on standardization in longitudinal studies: don't. *Frontiers in Psychology*, *6*, 1389.
- Nieuwenhuis, J., & Hooimeijer, P. (2016). The association between neighbourhoods and educational achievement, a systematic review and meta-analysis. *Journal of Housing and the Built Environment*, *31*(2), 321–347.
- Nieuwenhuis, J., Hooimeijer, P., & Meeus, W. (2015). Neighbourhood effects on educational attainment of adolescents, buffered by personality and educational commitment. *Social Science Research*, *50*, 100–109.
- Nieuwenhuis, J., Hooimeijer, P., van Dorsselaer, S., & Vollebergh, W. (2013). Neighbourhood effects on school achievement: The mediating effect of parenting and problematic behaviour? *Environment and Planning A*, *45*(9), 2135–2153.
- Nieuwenhuis, J., Hooimeijer, P., van Ham, M., & Meeus, W. (2017). Neighbourhood effects on migrant and native youth's educational commitments, an enquiry into personality differences. *Urban Studies*, *54*(10), 2285–2304.
- O'Brien, T. B., & DeLongis, A. (1996). The interactional context of problem-, emotion-, and relationship-focused coping: The role of the Big Five personality factors. *Journal of Personality*, *64*(4), 775–813.
- Ozer, D. J., & Benet-Martinez, V. (2006). Personality and the prediction of consequential outcomes. *Annual Review of Psychology*, *57*, 1–21.
- Peske, H. G., & Haycock, K. (2006). *Teaching inequality. How poor and minority students are shortchanged on teacher quality*. Washington, DC: The Education Trust.
- Portes, A., & MacLeod, D. (1996). Educational progress of children of immigrants: The roles of class, ethnicity, and school context. *Sociology of Education*, *69*(4), 255–275.
- Preacher, K. J., Curran, P. J., & Bauer, D. J. (2006). Computational tools for probing interaction effects in multiple linear regression, multilevel modeling, and latent curve analysis. *Journal of Educational and Behavioral Statistics*, *31*, 437–448.
- Roberts, B. W., Kuncel, N. R., Shiner, R., Caspi, A., & Goldberg, L. R. (2007). The comparative validity of personality traits, socioeconomic status, and cognitive ability for predicting important life outcomes. *Perspectives on Psychological Science*, *2*, 315–345.
- Willis, P. (1977). *Learning to Labor*. New York, NY: Columbia University Press.