

Behaviour of parents and children in two contrasting urban neighbourhoods: an observational study

Daniel Nettle

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Abstract Studies based on self-report questionnaires suggest that there are social gradients in parental investment within developed societies, with reduced investment occurring in families of lower socioeconomic position. However, these results have not been investigated by direct observation of behaviour in its natural setting. Here, I report the results of an observational study of behaviour of parents and children on the streets of two neighbourhoods of the same city, one affluent and one deprived. In the deprived neighbourhood relative to the affluent one, children were more likely to be on the streets in the evenings, were less likely to be accompanied by adults, infants were more likely to be crying, and babies were more likely to be in the care of children. Where mothers were present, though, they were less likely to be the sole adult with a brood. In particular, there was a greater prevalence of groups consisting of multiple females plus children. Although only two sites have been studied here, the method could be extended to other areas, and the initial results confirm that, under harsh environmental conditions, children receive less care by adults, alloparenting of infants by children becomes more important, and women mitigate the costs of caring for children by cooperating with other adults, particularly other women.

Keywords Human behavioural ecology · Parental investment · Infant crying · Cooperative breeding · Observational methods

Introduction

Human parenting behaviour is strongly socially patterned in developed countries such as the UK. The pattern is visible in a number of ways. Under conditions of lower socioeconomic position, mothers breast-feed less (Nettle 2010), do fewer activities with their children (Lawson and Mace 2009), spend less time interacting with them (Zick and Bryant 1996; Sayer et al. 2004), and report themselves as less warm towards them (Klebanov et al. 1994). The social gradients in paternal behaviour are even stronger than those in maternal behaviour (Nettle 2008; Lawson and Mace 2009). Most strikingly, there are very large socioeconomic discrepancies in the probability of fathers being involved at all; the proportion of English 5 year olds with regular contact with a father figure ranges from over 90% in the richest neighbourhoods to around 60% in the poorest (data from Nettle 2010). Even where fathers are present, they do more activities with their children if they are of higher socioeconomic position (Lawson and Mace 2009). Reciprocally, children from poor neighbourhoods feel less supported by their parents than do their peers in more affluent areas (Nettle and Cockerill 2010).

A number of recent authors have discussed the ultimate causes of the social gradient in parental investment. It is clear that deprived areas constitute harsher environments, in the sense that, for people living in such areas, life expectancies are shorter, health for age tends to be poorer, and measures of stress and somatic condition tend to be worse (Geronimus et al. 2010; Nettle 2010). Thus, to some extent, parents may simply have less available capacity for parental investment, given their condition and the stresses they may be dealing with. In addition, if some of the extra health risk in deprived areas is extrinsic, meaning that it cannot be mitigated by decisions the individual can make,

D. Nettle (✉)
Centre for Behaviour and Evolution, Newcastle University,
Henry Wellcome Building, Framlington Place,
Newcastle NE2 4HH, UK
e-mail: daniel.nettle@ncl.ac.uk

then the adaptive response is for parents to increase the pace of their reproductive output, in order to have a good chance of completing their families whilst they still can, even if that comes at a cost in terms of available investment per child (Geronimus 1996; Geronimus et al. 1999). In support of this prediction, there are strong inverse correlations between local rates of mortality and morbidity and women's age at first reproduction, both within and across societies (Wilson and Daly 1997; Low et al. 2008; Nettle 2010, 2011a; Quinlan 2010). Finally, it may be the case that, in harsh environments or where human capital is low, parental investment is less effective at improving child outcomes than it is in more benign environments (Kaplan 1996; Kaplan et al. 1998; Quinlan 2007). For example, in a previous study (Nettle 2008), I found that British fathers of higher social class made more difference to their child's cognitive development when they invested than did fathers of lower social class. Thus, parents in more deprived areas have less incentive for increasing per-child parental investment, because it provides less fitness return in the long run (see Lawson and Mace 2011 for a review of recent evidence in support of this idea).

The greater steepness of the gradient in paternal as compared to maternal behaviour reflects the fact that human males are facultative parental investors (Geary 2000). Thus, faced with harsh environments, they can more easily withdraw investment than can women. However, human offspring are highly altricial, and spaced so that families often have multiple dependents simultaneously, and so the absolute cost on parents remains high even in the lowest-investing communities. Thus, women need to depend on alternative sources of childcare other than themselves. Indeed, there has been increasing recognition that humans are cooperative (or, more exactly, communal) breeders, and that in many societies, other sources of non-maternal care, such as from maternal grandmothers and older siblings, are more important than is care from fathers (Sear and Mace 2008). This female alloparental care may become particularly important where paternal investment is low (see, e.g., Leonetti et al. 2004).

Whatever the ultimate causes of the social gradient in parental investment in developed societies, it is clear that it exists. However, almost all the previous literature on this topic is based on self-reports of behaviour, whether they be from national censuses, regular surveys of members of a cohort, or one-off questionnaires. This is not an unusual state of affairs. As has been pointed out elsewhere, self-report surveys have become the dominant mode of investigation in the human behavioural sciences (Baumeister et al. 2007; Furr 2009). Whilst such surveys have many obvious advantages, their predominance also gives rise to disquiet. Data are only gathered from those individuals who volunteer to take part, who may differ systematically

from those who do not. This problem, known as volunteer or participation bias, has been understood in social science research for many years (e.g. Griffith and Walker 1976; Catania et al. 1990). There are also obvious problems of the reliability of self-report in areas where there are social judgements attracted by certain patterns of behaviour (and the participants know this). Actual behaviour can differ substantially from people's claims about it (Garro 2010). Moreover, self-report questions are often crude, requiring the participant to aggregate over long time periods or make a global judgement about how or how often they do something. Such instructions can be interpreted different ways by different social groups, or are subject to memorial limitations and biases. Most importantly, much of the detail of everyday behaviour is necessarily lost. Time-use studies are perhaps the strongest methodology from this perspective. These have yielded very interesting results (Zick and Bryant 1996; Sayer et al. 2004), but they are still limited by self-report, and by the construction of the questionnaires, which may miss important patterns that become evident only after observation of the behaviours in question.

The goal of the present study was to bring an ethological perspective to bear on socioeconomic differences in parenting behaviour, in the hope of confirming and extending the understanding produced by questionnaire-based studies. By 'ethological approach' in this context, I mean direct measurement of behaviour in its natural setting, and behaviour on the streets, being public, was the natural place to begin. The study site was Tyneside, a conurbation of around 900,000 people in northeast England which is characterised by rather extreme socioeconomic inequality, patterned over short geographical distances. I have previously demonstrated neighbourhood differences in parent-child relationships in Tyneside using a more conventional questionnaire approach (Nettle and Cockerill 2010). Here, I selected two neighbourhoods which were closely matched in all regards except for the large difference in socioeconomic position of their populations (see "Study sites"), and performed a composite day (12 h) of direct behavioural observation on the streets of each one. After extensive piloting and practice, it became possible to record in real time the number of individuals on the street, whether they were adults, children or babies, in what social groups they were interacting, and whether certain behaviours of a priori interest (see below) were occurring. I observed striking differences in health behaviours such as smoking, drinking and running, which have been reported elsewhere (Nettle 2011b). With only two study sites, it would clearly not be possible to establish the existence of a general socioeconomic gradient in parenting behaviour. However, the self-report-based literature already suggests that such a gradient exists, and thus this study serves to validate that literature

by testing for predicted differences from two extreme points on the socioeconomic continuum, and also serves a hypothesis-generating function by providing data on how parents and children spend their time across the two sites.

The study links the literature on socioeconomic differences in parenting with some previously unconnected strands of research in social science. There is a very longstanding sociological and social-psychological tradition of direct observation of the size, structure and dynamics of human social groups, often on the streets (James 1951; Bakeman and Beck 1974), though this tradition, along with its companion tradition of urban field experiments (e.g. Dabbs and Stokes 1975; Latane and Dabbs 1975), appears to have given way to greater emphasis on surveys and laboratory experiments (Baumeister et al. 2007). In addition, there has been considerable research in the literature on urban design and planning looking at how the built environment influences behaviour, but with considerable emphasis on documenting behaviours in the streets (Sommer 1969; Whyte 1988; Zhang and Lawson 2009). None of this research has explicitly attempted to characterise socioeconomic differences in parenting strategies and children's behaviour. There are also a number of studies of children's outdoor play, motivated by the links between sedentary behaviour and child obesity. Most of these use questionnaire methods (e.g. Aarts et al. 2010; Bringolf-Isler et al. 2010) or diaries (Wen et al. 2009), even though the behaviour lends itself to ethological study. Although this literature has established that outdoor play behaviour may be inversely associated with socioeconomic position (Ellaway et al. 2007; Aarts et al. 2010), this finding has not been linked to social gradients in parenting strategies more generally.

The overall hypothesis of the study was that parental investment will be higher in the more affluent neighbourhood (area A) than in the more deprived one (area B), particularly from fathers. This general hypothesis leads to a number of more specific predictions.

1. Children on the streets in area B will more often be unaccompanied by adults than children on the streets in area A. This follows directly from the main hypothesis, since children on the streets without adults are necessarily looking after themselves at that point in time.
2. Children on the streets accompanied by adults will less often be accompanied by male/female couples in area B than in area A. This follows from the prediction that it is men in particular who withdraw parental investment in harsh environments. It can also be predicted from the known number of households in area B which are described in the census as headed by a lone parent, since UK lone parents are overwhelmingly female.

3. Women on the streets of area B with their children will more often be accompanied by other women than is true in area A. This follows from the prediction that, as men withdraw their investment, other women's alloparental behaviour increases in compensation. It is not possible to determine by observation alone whether women observed with children are those children's mothers, and thus the overall frequency of female alloparental care cannot be estimated in the current study. However, if we observe an increased prevalence in area B of children accompanied by multiple adult women, that would suggest that women are using their female-female relationships more to cope with the costs of looking after children in their daily activities. It will not be possible to determine whether those female-female relationships are with unrelated friends or kin.
4. Babies will more often be being cared for by other children in area B than in area A. This stems from the prediction that, if parental investment is reduced, older children become more important sources of alloparental care. It proved impractical to estimate the age of every child in the field, and so it is not possible to test for the occurrence of mixed-age groups where the older children are looking after the younger ones. However, it is easy to distinguish between babies and children, and a group consisting of only babies and children is necessarily one in which the children are providing alloparental care for the baby. Thus, we should predict a greater frequency of such groups in area B.
5. Babies will more often be crying in area B than area A. The function of human infant crying is to elicit care from older individuals (Zeifman 2001). Thus, if parents are generally less responsive in terms of care provision in area B than area A, we should expect to observe more crying taking place.

Study sites

The UK census divides the country into small neighbourhoods with populations of 1–2,000 people (lower super output areas, LSOAs). Using the census, I selected and defined two neighbourhoods around 4 km from the city centre of Newcastle upon Tyne, one to the north and one to the west, each composed of two contiguous LSOAs (area A = Newcastle upon Tyne 005C plus 006E; area B = Newcastle upon Tyne 27D plus 29B). The two neighbourhoods were chosen because of their high degree of similarity by many measures. Both consist of a main shopping street, with supermarkets, smaller shops, cafés

and bus routes to the city centre, backed on either side by streets of terraced housing, and both contain substantial green space. The population density, structure and ethnic composition of the two neighbourhoods are very similar (Table 1). However, in socioeconomic terms, the two neighbourhoods are highly contrasting. The UK government measures socioeconomic characteristics of areas with an Index of Multiple Deprivation. By this measure (2004 data), area B is in the most deprived 1% of all English LSOAs, whilst area A is at the 79% percentile. This means, for example, that 18% of people own their own houses in area B, compared to 83% in area A; 16% of people in area B have managerial or professional jobs, as opposed to 74% in area A; and 57% of adults in area B report themselves to be in good health, compared to 78% in area A. The frequency of crime overall is around twice as high in area B compared to A, although for violent crime the difference is close to sixfold (Nettle et al. 2011).

Materials and methods

Sampling

I recorded data for every minute of a composite day (0900–2100 hours) in each neighbourhood, by dividing the time into 30-min segments, and recording one segment on each available weekday from each neighbourhood over the period 19 April–8 July 2010. Segments were completed in random order, but once a particular time of day had been sampled in one area, it was sampled in the other area as soon as possible (median delay 1 day; maximum 4 days). Area A was the first to be observed for 14 of the segments, and area B first for the other 10. All five weekdays were represented at least 3 times in the data for each area. I spent the first 10 min of each segment walking the complete length of the main shopping street, and the remaining 20 min walking at normal speed along pseudorandomly varying routes through the residential streets. All data collection occurred on school days during the school term.

Table 1 Comparison of the two study areas

	Area A	Area B
Total population (males)	3,098 (1,502)	3,223 (1,508)
Under 16 years	710	808
Median age	37	34.5
Households	1,250	1,589
Population born in UK (%)	92	92
Index of multiple deprivation	8.74	76.43
Index of multiple deprivation (IMD), percentile of English neighbourhoods	79th	1st
Households with children with only one resident parent (%)	12	50

All figures are averages for the two constituent census LSOAs of each area. Sources: 2001 census and 2004 indices of multiple deprivation. IMD percentile is of all English census LSOAs, where 1st represents the most deprived 1%

Data recording

I wore a digital voice recorder and noted each social group encountered (i.e. passed within plain sight for long enough to be identified). Groups were demarcated on the basis of members standing talking together, moving together, or involvement in a mutual game. For each group, I counted the number of individuals and classified each as man, woman, child (estimated to be of statutory school age, i.e. 16 years or under), or baby (small child not walking independently). In what follows, ‘minors’ refers to children or babies. Relevant behaviours such as crying, smoking and drinking were noted for each individual. No formal attempt was made to examine inter- or intra-observer reliability, but observations were limited to parameters which were clear and unambiguous. People inside buildings were not recorded, though those in open gardens or yards which were clearly visible from the street were. Individuals re-encountered within the same time segment were not re-recorded. Data were transcribed to a database.

Ethics statement

All individuals observed were in public spaces where they would have expected their behaviour to be visible to others. No personally identifying information was recorded, and the researcher, though never questioned, was ready to explain the nature and purpose of the study to any individual concerned. The study was approved by the Faculty of Medical Sciences ethics committee, Newcastle University.

Results

Patterns of street use

Table 2 provides data for the numbers of individuals and groups observed in each area. More people were observed overall in area B, and this was not fully explained by the larger resident population in that area; the population is 4%

greater than that of area A, but 15% more individuals were observed over the 12 h. The difference was, however, entirely driven by observing more children and babies in area B; the number of adults observed was actually slightly smaller (Table 2). The age-classes (adults, children, babies) were significantly differently distributed across the two areas ($\chi^2 = 299.31$, $df = 2$, $P < 0.01$), and the increased proportion of minors observed in area B was not fully explained by differences in the resident population of minors. There were 14% more minors residing there at the 2001 census, but I observed 102% more minors on the streets.

Breaking down street use by time of day, type of street and adults versus children (Fig. 1), we can see that the pattern of street use is similar in the two areas, except for children on the residential streets. Children observed on residential streets increases after 1500 hours (end of school

day) in both areas, and in area B it remains high until the end of the evening, whilst in area A it declines rapidly.

Adult accompaniment of children

Of the social groups containing a minor in area B, 35.6% contained no adult (379/1,063), compared to 25.4% in area A (148/583). This difference was significant ($\chi^2 = 18.24$, $df = 1$, $P < 0.01$; Fig. 2a). The greater number of unaccompanied children on the streets is largely driving the observation of more children overall in area B in the evenings. After 1500 hours, I observed 187 more accompanied children in area B than area A, but 537 more unaccompanied children.

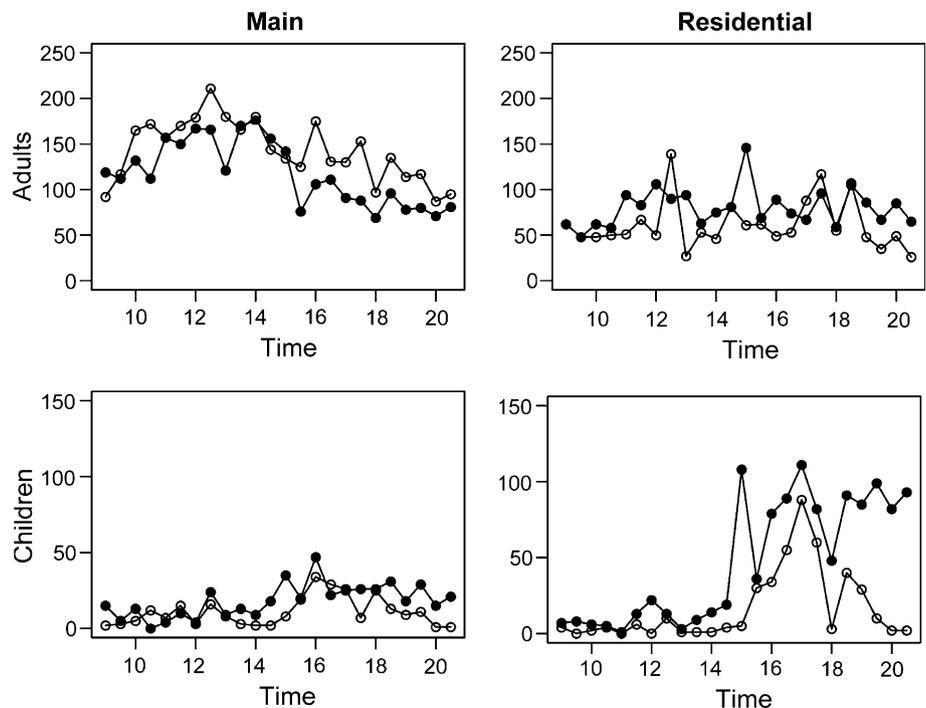
Given the known differences in proportions of single-parent households, I expected that mixed groups of adults and children in area B would more often contain a single adult rather than two or more. In fact, this was not the case. Mixed groups of adults and children significantly more often contained multiple adults in area B than in area A ($\chi^2 = 30.27$, $df = 2$, $P < 0.01$), with the excess arising from more two-adult groups, and also more groups with three or more adults (Fig. 2b). Moreover, mixed groups of adults and children were no less likely to contain a male adult in area B than in area A (area B, 248/684 or 36.3%; area A, 142/435 or 32.6%; $\chi^2 = 1.53$, $df = 1$, $P > 0.10$).

However, when I classified mixed groups of adults and children into single female adult, single male adult, male/female couples, multiple adult females with no males, and

Table 2 Overall numbers of individuals and groups observed across the two areas

	Area A	Area B
Total number of people	5,884	6,757
Number of adults	4,888	4,750
Number of children	705	1562
Number of babies	291	445
Proportion of minors	16.9%	29.7%
Number of social groups	4,123	3,773

Fig. 1 Number of adults (top row) and children (bottom row) observed in main (left) and residential streets (right) in each time segment of the composite day. Open circles represent area A and filled circles represent area B



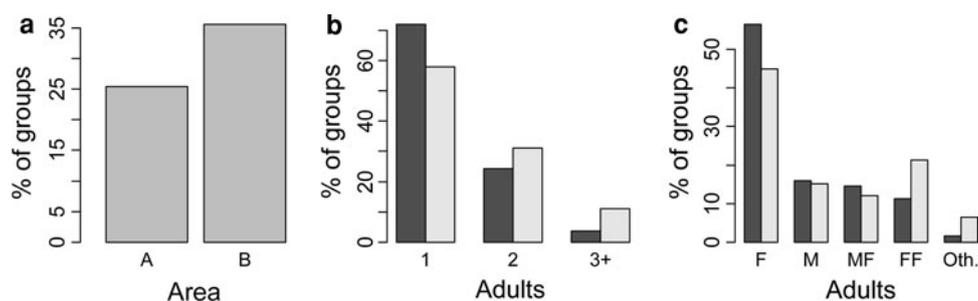


Fig. 2 **a** The percentage of groups containing minors which were not accompanied by any adult for the two areas; **b** percentages of mixed groups of adults and minors containing the one, two, or three or more adults for area A (dark bars) and B (light bars); **c** percentage of mixed

groups of adults and minors which contained a single adult female (F), a single adult male (M), a male/female couple (MF), multiple females but no male (FF), or any other configuration (Oth.), for area A (dark bars) and B (light bars)

other compositions, there were significantly different distributions of group types in the two areas ($\chi^2 = 36.81$, $df = 4$, $P < 0.01$). Figure 2c shows that this is driven in particular by there being a relative abundance of groups consisting of multiple adult females in area B, or, conversely, a relative excess of single female adult groups in area A. Note that male/female couples are also relatively over-represented in area B, given that only 50% of households with children in area B have two resident parents, compared to 88% in area A (Table 1).

Alloparenting by older children

The measure of alloparental behaviour by children was to count the number of times I saw babies on the streets accompanied by only children and no adults (see “Materials and methods”). This was observed for 14 babies in area B, but none in area A ($\chi^2 = 9.33$, $df = 1$, $P < 0.01$).

Children crying

I observed 7 of 445 babies crying in area B, as against 0 of 291 in area A. This was a significant departure from the null hypothesis of equal prevalence of crying (Fisher’s exact test, $P = 0.046$). In addition, I heard four more babies or children crying in area B (none in area A) but could not see them to confirm.

Discussion

Simple observational methods revealed marked differences in social behaviour in the streets of two contrasting neighbourhoods of the same city. In area B, children were more likely to be on the streets after school, and more likely not to be accompanied by an adult. I saw babies being cared for by older children in area B but not A, and babies were more likely to be crying in area B than area A. However, when

children and babies were with adults, they were more likely to be with several adults in area B than in area A. Accompaniment of children was predominantly an activity of single adult females in both areas, but in area A this was particularly likely to be the case. In area B, groupings of several adult females plus their children and babies were significantly more frequent, and male/female couples were also relatively abundant when you consider that there are fewer households with two resident parents in area B.

How are we to interpret these differences? The overall pattern is consistent with previous survey findings suggesting that there is in general reduced parental investment under conditions of lower socioeconomic position. Children in area B are more likely to spend their evenings playing and socialising on the streets. This may of course come down to factors as simple as smaller houses and gardens in area B, though it could also indicate fewer by way of formal activities organised or funded by parents. However, more tellingly, when children from area A do use the streets, they are more likely to do so with the accompaniment of an adult, which is fairly direct evidence of greater parental time and energy allocation to supervision of children (and supports prediction 1). Added to this, infants in area B were more likely to be crying, supporting prediction 5. Given that human infant crying functions to elicit care (Zeifman 2001), this suggests that allocation of care is often less in area B than area A. However, it is not clear that the lesser parental involvement in area B should be interpreted entirely negatively in terms of child welfare; autonomous outdoor play has positive effects on physical activity (Wen et al. 2009; Bringolf-Isler et al. 2010), and presumably on the development of social competence as well. It may be that the conditions of affluent modernity evoke levels of per-child parental investment which exceed those ever expressed in ancestral contexts and which may not necessarily be adaptive (Kaplan 1996).

The results observed are also consistent with the idea of greater mobilisation of alloparental care in area B than area

A. In area B, children were observed caring for babies (supporting prediction 4), suggesting that older siblings engage in situations where parental involvement may be less. Moreover, in area B, there was a marked relative excess of social groups containing multiple adult women and their children (supporting prediction 3).

Children were no less likely to be in the company of men in area B than area A, contrary to prediction 2. Given that fewer children there reside with men, this suggests that men may actually be doing more in terms of direct interaction with children. This is contrary to the results of studies using other methods (Nettle 2008; Lawson and Mace 2009), and warrants further investigation. Of course, merely being on the street in a group with a child does not mean activities focussed on the child, and thus it could be that the current method measures different things from the survey approaches, which assess activities such as reading to the child. It is also not clear to what extent the observations merely reflect the greater likelihood of underemployment amongst men in area B, meaning they are more often available to accompany their families.

Overall, though, an unpredicted finding was that women caring for children were less likely to be the sole adult in the group in area B than area A. That is, parenting behaviours were more often *socialised*, whether that be with other women, or with men (or indeed with a mixture of men and women). This is definitely not a consequence of women in area B simply living in households containing more adults than those in area A, since the reverse is true. Instead, it seems that the costs of having attendant children are more often pooled across members of multiple households. This is a striking observation. It may be that adults in area B are in a poorer state in terms of bearing the burden of children on their own, and thus are more likely to use cooperative strategies, or that they have fewer financial resources which can be used to make childcare easier, and so instead use social relationships. There may also be more multigenerational families with women and their mothers living close together, although my unquantified impression was that most of the group of women consisted of multiple individuals of reproductive age, who may have each children in the group, rather than mother plus grandmother. Overall, children's experience in area B is probably slightly more like a typical non-industrial society—in which there are multiple caregivers, kin and non-kin, adult and juvenile (Ivey 2000; Sear and Mace 2008; Hrды 2009; Kramer and Ellison 2010)—than is children's experience in area A.

The greater socialisation of childcare in area B is exactly the opposite of what one might predict given that area B, like deprived neighbourhoods in many industrial societies, has been found to have lower levels of 'social capital' than area A (Nettle et al. 2011) (social capital translates roughly as self-reported trust in others and perceived social support;

Sampson et al. 1997; Halpern 2004). It is, however, consistent with recent findings that adults of lower social class do better on tasks such as empathic accuracy, which assess social cognition, than their more affluent peers (Kraus et al. 2010). This would make sense if in fact they spend more of their time with others. Thus, the interrelationships between these behavioural observations, and the perceptions which form the basis of self-reported social capital, and psychological measures such as empathic accuracy, require further investigation.

The study has high ecological validity stemming from its method of directly observing naturally-occurring behaviour. However, it also has important limitations. I was not able to infer relationships amongst the individuals observed, and it is not possible to tell how much of the difference in social behaviour is simply driven by differences in the timing of economic activities of adults in the two neighbourhoods. However, differences in working patterns seem unlikely to account for women more often being with other adult women, or children being more often on the streets on their own in the evenings. I also only observed behaviour on the streets, and have no insight into what might be happening inside homes. The proportion of life which happens on the street feels very different in the two areas; in area B, for example, it is common to find people eating, or sitting and talking, in the street, in a way which is not seen in area A. Most importantly, these are only two neighbourhoods, making it impossible to assess the extent to which the differences here are general features of deprived versus affluent communities, or neighbourhood-specific effects. However, the self-report literature has already established the population-wide socioeconomic gradient, suggesting that some of these patterns are likely to be general. The contribution of this study is therefore to have developed and provided preliminary data from an ethological methodology which can serve to validate the socioeconomic gradient using non-self-report methods. I also extended the findings of other studies, by uncovering the greater socialisation of childcare in the more deprived neighbourhood. This is a pattern which I would not have thought to test for with a questionnaire, and probably would not have discovered by that method, but which opens up new avenues for future research. Thus, the appeal to include ethological methods as one extra tool in the box for the study of socially-patterned behaviours in developed societies is justified by results.

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