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Are Impulsive Adolescents Differentially Influenced by the Good and Bad of Neighborhood and Family?

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Abstract

Using the differential susceptibility perspective (Belsky & Pluess, 2009) as a guiding framework, age 12 neighborhood disadvantage (ND) and family characteristics (parental knowledge) were examined as moderators of the relations between age 12 youth impulsivity and the development (ages 13, 14 and 15) of positive (community activities) and negative (antisocial behavior; ASB) adolescent behavior. An interaction between ND and youth impulsivity (age 12) operated with differential susceptibility, but only for female community activities at age 13: under low levels of ND, impulsive adolescent females engaged in the highest levels of community activities, whereas under high ND, they engaged in the lowest levels. Exploratory analysis showed the association between community activities and ND to be partially related to parents' or adults' engagement in informal social controls (e.g., alerting the police with misbehavior in the neighborhood). Differential susceptibility effects were not identified for: (i) parental knowledge and impulsivity; (ii) ASB (ages 13, 14 or 15); or (iii) community involvement at ages 14 and 15. Findings provide limited evidence for impulsivity as a differential susceptibility phenotype.

Developmental models (Belsky & Pluess, 2009; Boyce & Ellis, 2005) suggest that certain individuals do not simply vary in the degree to which they are vulnerable to the negative effects of adverse experience; rather, these individuals are thought to be especially susceptible to the positive developmental consequences of supportive environments. A majority of "susceptibility" research has examined the moderating effect of negative/difficult child temperaments on the association between parenting quality and externalizing type behaviors (Belsky & Pluess, 2009). For instance, difficult tempered offspring of attentive and positive mothers appear to show minimal increase in externalizing behaviors (Bradley & Corwyn, 2008; van Aken, Junger, Verhoeven, van Aken, & Dekovic, 2007) and gains in conscience and moral development (Kochanska, Aksan, & Joy, 2007). These studies have cued researchers to examine other characteristics that may operate differentially.

Impulsivity – the tendency to act on the spur of the moment, without planning or having a clear sense of decision – may be a susceptibility factor for both negative and positive

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outcomes. Existing studies suggest that impulsive children and adolescents are susceptible to adverse environmental influences. For example, the link between impulsivity and antisocial behavior (ASB) has been shown to be stronger for children living under high levels of neighborhood disadvantage (ND) (Lynam et al., 2000; Meier, Slutske, Arndt, & Cadoret, 2008; Trentacosta, Hyde, Shaw, & Cheong, 2009); and for children who have experienced harsh/negative parenting (Lengua, Wolchik, Sandler, & West, 2000; Leve, Kim, & Pears, 2005). According to the differential susceptibility perspective, however, impulsivity may not always portend future maladjustment. For instance, with the experience of a supportive environmental context, impulsive youth may learn to channel their energies into pro-social activities that offer positive socialization mechanisms.

The present paper examined factors that could lead to negative outcomes for impulsive youth in at-risk contexts or promote positive outcomes for these youth within a supportive context. Two key contextual factors were investigated in this regard: neighborhood disadvantage (ND) and parental knowledge. ND is a risk promoting contextual factor that is robustly associated with ASB (Ingoldsby et al., 2006). And, parental knowledge -- involving the tracking of the adolescent's whereabouts, activities and with whom s/he is with -- is one of the strongest protective factors against early adolescent ASB (Dishion & McMahon, 1998).

As mentioned, because of the different pathways adolescents can take, a negative and positive outcome was chosen for the current study. The negative outcome for this study was ASB and the positive outcome was involvement in constructive, organized and supervised activities (*community activities*). These outcomes were thought important because they can influence youths to follow two qualitatively different life-course pathways. For example, engagement in community activities is thought to provide opportunities to acquire and practice social, physical and intellectual skills; and to aide in establishing supportive and lasting social networks (Eccles, Barber, Stone, & Hunt, 2003). On the other hand, engaging in ASB has been shown to result in a number of life-snares (e.g., being arrested) and reinforcing factors (e.g., deviant peer influence, school failure, limited life-opportunities) (Moffitt, 2003) that may continue to hamper an adolescent's positive development. Indeed, research has shown community activities to be positively related to parental knowledge (Mahoney & Stattin, 2000), positively related to impulsivity (Persson, Kerr, & Stattin, 2004), but generally negatively related to ASB and less available in ND contexts (McHale, Crouter, & Tucker, 2001). This study tested these relations from early to mid-adolescence, a period when opportunities for community involvement and risk for ASB is increasing (Barker et al., 2007).

The current study is the first, to our knowledge, to test the extent to which the differential susceptibility model may accurately describe a "malleable" relationship between impulsivity and the development of positive (community involvement) and negative (ASB) adolescent behavior that is conditional on the experience of supportive (high parental knowledge) or negative (high ND) environmental contexts. To provide support for this model, we expected at least three findings. First, impulsive adolescents (age 12) with high parental knowledge (age 12) will engage in higher levels of community activities (age 13), but relatively lower levels with low parental knowledge. Second, both impulsivity (age 12) and high ND will associate with high ASB. Third, the differential susceptibility effects for parental knowledge among impulsive adolescents will be maintained over time (i.e., at ages 14 and 15). Because neighborhood processes and parenting are reported to vary for males and females (Kroneman, Loeber, & Hipwell, 2004; Neumann, Barker, Koot, & Maughan, 2010), we analyzed the hypotheses separately by gender.

Method

Sample

Participants were from the Edinburgh Study of Youth Transitions and Crime (Smith & McVie, 2005), a large-scale, representative cohort of children (4,597; 51% male) constituted at age 12 and studied annually to age 17. The initial recruiting sample ($N = 4469$) at wave 1 included 92% of the total population of youths, who were enrolled as first year pupils at Edinburgh secondary schools in autumn of 1998. Of these, 156 opted out, and 13 could not be surveyed due to logistic reasons ($n = 8$) or difficulties understanding the questionnaires ($n = 5$), resulting in a response rate of 96.2% at wave 1 (McVie, 2001). At the following waves, students who transferred to participating schools were also asked to participate; this resulted in the sample of 4597. The majority of participants (94.2%) were Caucasian; 1.6% were of Pakistani origin, 1.1% Chinese, 0.7% African, 0.7% Indian, 0.3% Bangladeshi, and 1.4% from other ethnic groups.

Procedure

Parental consent was obtained for all children who participated in the study. Trained researchers administered the self-report questionnaires to study members in classrooms. Absent students at each data collection wave were captured via follow-up visits to the school and by home visitation. To reassure participants about reporting sensitive information and to encourage honest reporting, particularly about their own behavior, a complete guarantee of confidentiality was given to each child.

Measures

The frequency of ASB in the previous year was assessed using self-report at ages 13, 14 and 15 years with the following nine items (response scale 0 = never to 7 = most days): 1) shoplifting, 2) breaking into a house/building, 3) joyriding, 4) disturbance of peace, 5) vandalize property, 6) arson, 7) break into car to steal something, 8) carried a knife or weapon for protection or in case it was needed in a fight, and 9) used force, threats, or a weapon to get money or something else from somebody. We created a composite score at each age. Coefficient alphas were .74, .77 and .76 for age 13, 14, and 15 respectively. Because the measure of ASB was extremely skewed, due to a preponderance of scores at the scale-minimum (i.e., over-dispersion of zeros), the ASB scores were log-transformed.

The frequency of community involvement was assessed via self-reports at age 13, 14 and 15. Youth were asked (1=yes, 0=no) on a typical week – during the evening – do they go to: 1) a youth club/group, 2) a sports club/centre, 3) aerobics/dancing, or 4) another type of club/group. A composite score (range of 0 – 4) was created to index community involvement.

Neighborhoods in Edinburgh were defined using geographic information system (GIS) and census level information (Smith & McVie, 2005). Postcode data were collected from the school records of all cohort members at sweep one, thereby allowing individuals to be allocated to one of these neighborhoods. Postcode information was available for 3,972 (92 per cent) of all eligible participants during the first wave. A small proportion of these youth (291) were residents of the city of Edinburgh, and, therefore, a total of 3,681 (85 per cent) of cohort members at wave one were allocated to one of the 91 Edinburgh neighborhoods at age 12. The average neighborhood cluster size was 112 (range 36 – 462).

Neighborhood disadvantage (ND) was determined by combining the neighborhood allocation with data from the 2001 census, which provided a range of demographic, housing, health, education and cultural information. The four variables used as indicators of ND were 1) % of population consisting of a lone parent with dependent children; 2) % of households

with more than one person per room; 3) % of population in local authority (public) housing; 4) % of population who are unemployed. For each adolescent, a ND score was computed by summing the values of these four indicators applicable to his/her allocated neighborhood.

Because it is the truly disadvantaged who are most at risk of being affected (Wikström & Loeber, 2000; Wilson, 1987), we identified the top 10% of the ND score to indicate those most at risk where 0 = low poverty and 1 = high poverty. Accordingly, 204 male and 191 female adolescents lived in ND versus 1,658 male and 1,624 female adolescents lived in non-ND.

Informal social control (Sampson, Raudenbush, & Earls, 1997) was measured via self-report items comprised of two questions (“would adults try to stop” and “would someone call the police”) for three scenarios: 1) “if someone was spray painting a wall in your neighborhood”, 2) “if someone was trying to steal a car in your neighborhood” and 3) “if teenagers were fighting in the street in your neighborhood” (6 items: Cronbach's alpha = .58). Due to the low alpha, we estimated a confirmatory factor analysis to help discriminate the reliability of the measure. The analysis showed adequate model fit (CFI = 0.96; TLI = 0.87; RMSEA = 0.08) and the standardized loadings varied from .30 to .62.

Impulsivity was measured via a reduced version of the Eysenck Impulsivity Scale (Eysenck, Easting, & Pearson, 1984) through self-report at age 12 on the following six items: 1) planning takes the fun out of things, 2) I get into trouble because I do things without thinking, 3) I put down the first answer that comes into my head on a test, and often forget to check it later, 4) I get involved in things that I later wish I could get out of, 5) I sometimes break rules because I do things without thinking, 6) I get so excited about doing new things that I forget to think about problems that might happen (Cronbach's alpha = .86).

Parental knowledge was assessed using adolescent report at age 12 (Cronbach's $\alpha = .75$) with the following three items: “In the last year, how often did your parents know 1) where you were going, 2) who you were with, and 3) what time you would be home” on a four point scale (1 = most days, 2 = at least once a week, 3 = less than once a week, 4 = never). Scores were recoded so that higher scores indicate higher levels of parental knowledge.

Attrition and missing data

Complete data for ASB and community activities was available for 94% of the original sample at age 13, 92% at age 14, and 90% at age 15. Self-reported risk data were missing for small proportions of the sample at age 12, ranging from 8% to 11%. Children missing on ND (20% of the total sample; $n = 917$) were more likely to be entitled to free school meals (24% vs. 16%), χ^2 ($df = 1$, $N = 3,706$) = 17.57, $p < .001$, and higher on impulsivity, $t(4185) = 2.11$, $p < .05$.

Analyses

Path analysis models were run in Mplus 5.21 (Muthén & Muthén, 1998-2009). Analyses proceeded in three steps. In step 1, we examined main effects of the age 12 predictors (i.e., ND, parental knowledge and impulsivity) on age 13 ASB and community activities. To ensure that any identified ND and parental knowledge risks were robust, family income (child eligible for free school meals) and family status (single caregiver) were controlled for in the pathways. To control for non-independence of the data, youth were clustered within neighborhoods defined by GIS scores.

In step 2, using the step 1 model, we added two two-way interactions (i.e., ND X impulsivity and parental knowledge X impulsivity) between the age 12 variables as predictors of age 13

community activities and ASB. In this step, we used the established evidentiary criteria for assessing differential susceptibility (Belsky & Pluess, 2009). First, we placed emphasis on interactions where the regression lines between the susceptibility and non-susceptibility groups crossed. Second, by the nature of the risk constructs evaluated (i.e., ND vs. parent knowledge), the effects tested in this study reflected potential interactions that cover both negative and positive aspects of the environment.

In step 3, we tested for direct and indirect influences of age 12 variables on age 14 and 15 ASB and community involvement. For direct influences, we assessed the main effects and interactions of the age 12 factors on age 14 and 15, independently. For indirect effects, we programmed MODEL CONSTRAINT statements.

All models were corrected for non-normal distributions by maximum likelihood estimation with robust standard errors (MLR). Missing data were accounted for by full information maximum likelihood estimation. Model fit was determined through the Comparative Fit Index and Tucker-Lewis Index (CFI & TLI; acceptable fit 0.90 – 0.95; (Bentler & Bonett, 1980) and root mean square error of approximation (RMSEA; acceptable fit 0.08 – 0.06; (Browne & Cudeck, 1993).

Results

Descriptive Statistics

Descriptive statistics for the study variables are presented in Table 1 by gender. In general, males had higher levels of ASB and impulsivity than females; conversely, females were higher than males in parental knowledge. Males and females did not significantly differ in levels of community involvement.

Step 1: Main Effects of Age 12 Predictors

The step 1 model – a multiple group model freely estimated for females and males (Figure 1) – fit the data well: $\chi^2(62) = 256.23, p < .001$; CFI = .98, TLI = .95, RMSEA=.041 (90% CI = .036 - .047). The main effects included: (i) impulsivity (age 12) positively associated with both ASB and community involvement, at age 13; (ii) ND associated with ASB (males) and lower community activities (females); and (iii) parental knowledge (age 12) associated with lower ASB (male and females) and higher community activities (females) (age 13).

Step 2: Second Order Interactions

In the next analytical step, two-way interactions were added one-by-one. Against our expectation, we found an interaction suggestive of a differential susceptibility effect for ND – for females only – but not for parental knowledge. Figure 2 illustrates that the link between high ND and lower levels of community activities was stronger for females high in impulsivity (simple slope: $\beta = -0.31, p < 0.01$), than for females low in impulsivity (simple slope: $\beta = -0.08, p > 0.05$). We describe this effect as ‘suggestive’ of differential susceptibility because: (i) under low ND, the impulsive females also showed highest levels of community involvement (see Figure 2); but (ii), the extent to which low ND can be conceptualized as a ‘supportive’ environment is debatable. We therefore, in an exploratory analysis, examined if this effect was not due to ND per se, but rather to social neighborhood processes that are likely to associate more with low ND rather than high ND, i.e., informal social controls such as adults/parents taking note of adolescent street gangs or calling the police (Sampson, Morenoff, & Earls, 1999). Once we controlled for age 12 informal social control, the age 12 ND X impulsivity interaction on age 13 community involvement became non-significant ($\beta = -0.01, p > 0.05$).

For males, the same ND X impulsivity effect was significant, but showed that for both high and low impulsive youth, community involvement decreased within high ND contexts (i.e., there was not cross-over in regression lines).

The interaction of parent knowledge X impulsivity on ASB was significant for females and showed that under the condition of high parental knowledge, both impulsive and non-impulsive engaged in lower rates of this problem behavior – i.e., the regression lines did not cross-over.

Step 3: Longitudinal Effects at Ages 14 and 15

We also sought to test the degree to which differential susceptibility effects – stemming from age 12 – could be identified at ages 14 and 15. We tested these effects both directly (age 12 on age 14 and age 15, respectively) and indirectly (age 12 on age 15, via ages 13 and 14). We failed to identify differential susceptibility, but note significant results from the analysis. For males, parental knowledge at age 12 continued to associate with lower levels of ASB at age 14 ($\beta = -0.08, p < 0.001$) and 15 ($\beta = -0.06, p < 0.05$). Impulsivity at age 12 continued to associate with an increase in ASB at age 14 ($\beta = 0.11, p < 0.001$) and 15 ($\beta = 0.06, p < 0.05$). Similarly, ND at age 12 associated with an increase in ASB at age 15 ($\beta = 0.06, p < 0.05$).

For females, parental knowledge (age 12) continued to associate with a decrease in ASB at 14 ($\beta = -0.05, p < 0.01$) but also an increase in community involvement at age 14 ($\beta = 0.09, p < 0.001$). As in males, however, age 12 impulsivity related to continued risk for ASB at age 14 ($\beta = 0.11, p < 0.001$).

We tested various exploratory indirect pathways. One indirect effect showed significance, and for girls, not boys: parental knowledge X impulsivity (age 12) associated with decreased age 15 ASB via a decrease in ASB at age 13 and 14 ($\beta = -0.018, p < .05$).

Discussion

The present study tested, but failed to provide strong support, for impulsivity as a differential susceptibility phenotype. That is, we were unable to show that a ‘supportive’ family environment, such as one where parents have high knowledge about their child’s whereabouts, could promote a positive developmental pathway, such as engagement in community activities. One potential reason for this null finding is that parent knowledge, in itself, may not be sufficient to channel the energies of impulsive youth into more pro-social activities. Recent research suggests that an effective form of parenting (i.e., that which promotes independence and self-regulation in offspring) is the combination of warmth, consistency and high levels of knowledge (Fowler, Toro, Tompsett, & Baltes, 2009; Patrick, Snyder, Schrepferman, & Snyder, 2005). Hence, the measure employed in the present study may not have the specificity needed to detect a family-based “differential” effect for impulsive youth.

Against our expectations, we found an interaction suggestive of a differential susceptibility effect for ND. That is, impulsive females in a context of low ND (age 12) engaged in higher levels of community activities (age 13). In an exploratory analysis, this ND effect was partially due to informal social controls such as adults/parents taking note of strangers, calling the police, etc. (Sampson, et al., 1999). Whether via neighborhood social processes or processes within the family, this finding underscores the importance of adult authority figures for positive development, particularly for impulsive adolescents (Schonberg & Shaw, 2007). Previous research examining impulsivity, neighborhood risk and ASB has suggested the beneficial effects of adult ‘social control’ in the neighborhood and in the

family (Lynam, et al., 2000; Meier, et al., 2008; Trentacosta, et al., 2009) but did not include both positive and negative developmental outcomes, for females and for males. The fact that this effect was found for females supports the idea that parents – in general – provide more supervision for females than males (Kim, Hetherington, & Reiss, 1999), but also that parents may allow females greater exposure to the community when the community is deemed safe (Kroneman, et al., 2004).

The ND x impulsivity effect for males suggested that community involvement decreased with high ND, for both high impulsive and low impulsive youth. That said, we did not find a ND by impulsivity interaction in the prediction of male ASB, which seems to contradict results of other studies (e.g., Trentacosta et al., 2009). As stated, the results of the present study are not directly comparable with earlier studies, as the present study included a positive behavioral outcome.

The last goal of this paper was to test the extent to which differential susceptibility effects (at age 12) were maintained over time (i.e., at ages 14 and 15). We failed to find significant longitudinal evidence of differentially susceptibility. Nevertheless, parental knowledge at age 12 continued to associated with lower ASB at age 14 (both genders) and age 15 (males), and for impulsive females, up to age 15. Hence, the present results suggest parental knowledge at the onset of adolescence can have lasting positive effects.

Limitations should be borne in mind when interpreting these results. First, the majority of constructs were assessed by self-reports, hence shared method variance may account for a portion of the associations. Second, the degree to which the present findings can be generalized to diverse populations may be limited. The majority of participants were Caucasian, and from a single urban community. Third, our measure of community involvement was limited. A better assessment includes the duration and breadth of participation (Fredricks & Eccles, 2006), as well as an indication of adult authority figures. Fourth, this study is correlational in nature, and hence does not show causal relationships between context, impulsivity and positive and negative development, as could a randomized multi-modal experimental intervention nested within a longitudinal design.

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Figure 1. Standardized path estimates from the path model for male and female adolescents. All interaction terms were tested independently, i.e., without the other interaction terms in the model. Only statistically significant (p at least $< .05$) paths (boys/girls) are shown.

Figure 2.
The interaction between ND and impulsivity on female community involvement

Table 1

Descriptive Statistics: Continuous Study Variables for Male and Female Adolescents.

	Male adolescents				Female adolescents				<i>t</i>	<i>p</i>
	<i>M</i>	<i>SD</i>	<i>Skew</i>	<i>Kurtosis</i>	<i>M</i>	<i>SD</i>	<i>Skew</i>	<i>Kurtosis</i>		
ASB 13	0.43	0.42	0.56	-0.98	0.31	0.38	0.91	-0.43	9.42	<.001
ASB 14	0.48	0.47	0.47	-1.15	0.39	0.45	0.69	-0.82	6.51	<.001
ASB 15	0.45	0.48	0.61	-0.96	0.34	0.41	0.86	-0.83	7.68	<.001
Community age 13	0.71	0.69	0.67	0.35	0.74	0.79	0.90	0.48	-1.56	<.127
Community age 14	0.88	0.67	0.57	0.97	0.86	0.75	0.59	0.47	0.94	<.352
Community age 15	0.83	0.66	0.53	0.78	0.79	0.76	0.76	0.54	1.68	<.090
Impulsivity Age 12	14.02	5.49	-0.47	-0.22	12.53	5.62	-0.26	-0.54	8.69	<.001
Parental Knowledge Age 12	9.35	2.07	-0.58	-.31	9.95	1.88	-.88	0.26	-9.99	<.001

Note. ASB = antisocial behavior.