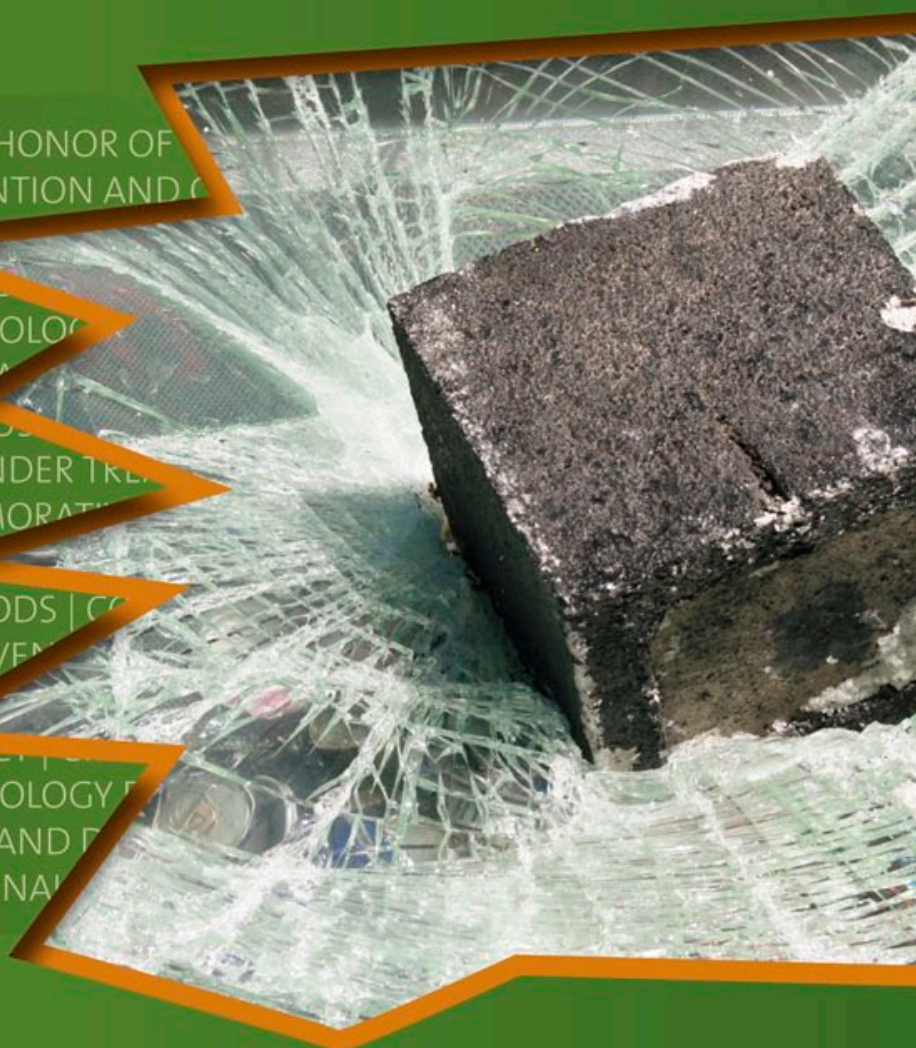


Thomas Bliesener
Andreas Beelmann
Mark Stemmler (Editors)

Antisocial Behavior & Crime

Contributions of Developmental
and Evaluation Research
to Prevention and Intervention

| COMMEMORATIVE VOLUME IN HONOR OF
FRIEDRICH LÖSEL | CRIME PREVENTION AND
JUSTICE | CRIMINOLOGY RESEARCH
| PSYCHOLOGY AND DELINQUENCY
AND CRIMINAL JUSTICE | CRIMINOLOGY
FRIEDRICH LÖSEL | PSYCHOLOGY AND
MANAGEMENT AND CRIMINAL JUSTICE
| CRIME PREVENTION AND OFFENDER TREATMENT
RESEARCH METHODS | COMMEMORATIVE VOLUME
DELINQUENCY | CRIME PREVENTION AND
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FRIEDRICH LÖSEL | PSYCHOLOGY AND DELINQUENCY
| RISK MANAGEMENT AND CRIMINAL JUSTICE



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Research to Prevention and Intervention*

**Thomas Bliesener, Andreas Beelmann,
and Mark Stemmler (Editors)**



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EUROPE: Hogrefe Publishing, Merkelstr. 3, 37085 Göttingen, Germany
Phone +49 551 99950-0, Fax +49 551 99950-425,
E-mail publishing@hogrefe.com

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F. Lösel

Preface

In Honor of Friedrich Lösel

“It is never too early and never too late to start preventive measures for antisocial behavior and criminal offending.” This has always been the credo of Prof. Dr. Dr. h.c. Friedrich Lösel, whom we are honoring with this book on the occasion of his retirement from active service at the Friedrich-Alexander-University Erlangen-Nuremberg in September 2011.

Presenting Friedrich Lösel and his scientific achievements is no easy task. Even his professional colleagues find it hard to grasp his scientific work in all its entirety. Three reasons for this stand out in particular: First, the psychologist Friedrich Lösel has always linked his main field of research – psychology and law – to the neighboring forensic disciplines of law, psychiatry, and, in particular, criminology. As a result, he has published his work on the relevant publication platforms of these disciplines, and their contents are not always located in the mainstream of psychology. The second reason is his tremendous productivity that has given us numerous monographs as well as hundreds of book chapters and articles in leading journals. And third, the breadth of topics covered by his work is quite remarkable. He has not just addressed the development of antisocial behavior in all its facets from childhood to adulthood – so to speak, from the sometimes heated fights over the toy excavator in the sandbox up to the most serious assaults and homicides. He has also always been interested in how some people show a normal, healthy development under circumstances in which others show deviant developments or problematic behavior. Nonetheless, he does not just consider the question “Why?” but also always asks “What can we do about it?” – as confirmed impressively by his numerous publications on prevention and treatment research. In this field, Friedrich Lösel has always applied exceptionally sophisticated research methods, and has even gone on to tackle methodological problems and questions, as can already be seen in 1974 in a joint publication with Werner Wüstendorfer on the missing data problem (Lösel & Wüstendorfer, 1974). More general, it is no exaggeration to call him one of the nestors of German evaluation research. Together with his friend and colleague Werner Wittmann, he was responsible for introducing empirical evaluation research and, in particular, the highly popular approach of meta-analysis where he has made major contributions (see Lösel, 1987; Lösel & Beelmann, 2003; Lösel & Nowack, 1987; Lösel & Schmucker, 2005).

Friedrich Lösel was born on July 28, 1945 in the small town of Neuendettelsau to which his family had been evacuated due to the heavy wartime bombing of their home town of Nuremberg. However, the family soon returned to Nuremberg, and Friedrich Lösel remained in Franconia throughout his schooldays and studies right up until his first assistant professorship. His first scientific post in the Collaborative Research Center “Socialization and Communication” at the Sozialwissenschaftliche Forschungszentrum (SFZ) in Nuremberg already introduced him to those topics that have particularly interested and motivated him throughout his career: The conditions in which

antisocial behavior emerges and develops along with its prevention and treatment. The empirical approach to analyzing this topic can already be seen in his PhD thesis “Handlungskontrolle und Jugenddelinquenz: Theoretische Integration und empirische Prüfung [Action control and juvenile delinquency: Theoretical integration and empirical assessment]” (Lösel, 1975), in which he developed a theory of delinquency similar to that to be found in later years in the criminology of Gottfredson and Hirschi (1990) or Sampson and Laub (1993).

Friedrich Lösel has not just pursued causal research. Even while still at the SFZ, he worked on developing a program for the training and development of prison personnel that could be used to improve the treatment and resocialization of offenders (Braune, Klapprott, Linz, Lösel, & Runkel, 1982). In 1978, his PhD was followed by his post-doctoral habilitation – also at the University Erlangen-Nuremberg. After a short stay at the University of Bamberg, he returned to his home university in 1979. In 1982, he was offered a professorship in Bielefeld. There he performed a systematic, comprehensive, and detailed evaluation of research on treatment in the social-therapeutic units of the German prison system with funding from the Federal Ministry of Research and Technology. Methodologically, this was a pioneering feat in what has now become the highly popular field of meta-analysis. In addition, the results of this study impacted particularly significantly on crime policy. In a time still strongly characterized by the doctrine of “nothing works” in offender treatment, Friedrich Lösel was the first to confirm – before similar meta-analyses performed by American colleagues – a small to moderate but nonetheless significant improvement in the success of treatment in social therapy compared to regular incarceration (Lösel, Köferl, & Weber, 1987).

Within the framework of the Collaborative Research Center “Prevention and Intervention in Childhood and Adolescence” set up at Bielefeld University in 1986, Friedrich Lösel extended his research perspectives and studied – for the first time in Germany – the concept of resilience, that is, the healthy development of children and adolescents despite adverse circumstances (Lösel & Bliesener, 1990, 1994; Lösel, Bliesener, & Köferl, 1989). These studies on the risk and protective factors for healthy development have received a great deal of attention throughout the world (see Lösel & Bender, 2003), paving the way decisively for much further research, and also forming the scientific basis for numerous prevention and intervention approaches addressing antisocial behavior from early childhood to adulthood.

However, Bielefeld – located in tranquil East Westphalia – could not keep him away from his home town. In 1987, he was offered a professorship in Erlangen where he took over the Chair for Psychology at the Institute of Psychology. A project funded by the Bavarian Ministry of Justice led him once more to the question of the treatment of offenders. He studied the consequences of being housed in a closed children’s home as an alternative to incarceration for juvenile offenders. Here as well, he found moderate, but, under specific conditions, consistent successes for these institutions that are often still discredited even today (Lösel & Pomplun, 1998).

Parallel to this, he ran a large-scale study for several years on violence and aggression in youth with funding from the Federal Criminal Police Office. Combining an extensive survey in the Nuremberg–Erlangen region with elaborate and intensive laboratory studies, he analyzed the biological, psychological, and social conditions

and correlates of aggressive behavior in the young (Bliesener & Lösel, 2001; Lösel & Bliesener, 1998, 2003a; Lösel, Bliesener, & Bender, 2007). He also studied the long-term consequences of earlier socio-emotional problems at school. In several studies, he was able to confirm that bullying at school is a significant predictor of later anti-social behavior, delinquency, and violence (Bender & Lösel, 2011; Lösel & Bender, 2011). This was joined by further research projects in the 1990s in which Friedrich Lösel drew on earlier work to obtain new and valuable findings. He continued the studies on resilience in a project on protective factors due to the quality and stability of relationships in long-term marriage partners with funding from the Federal Ministry for Families (Lösel & Bender, 1997, 2003). In addition, he worked on the development of a differentiated diagnostic instrument to assess the risk factors for child abuse and neglect in families in a cooperation project involving the “Bridge Child Care Development Service” in England and the “Center for Family Issues” in Greece funded by the European Union (Bender & Lösel, 2004; Lösel, Holzberger, & Bender, 1999).

In preparations for soccer’s 2000 European Championship in Belgium and the Netherlands, the soccer lover and die-hard fan of the Nuremberg soccer club received a grant from the Federal Ministry of the Interior to study the phenomenon of hooliganism in Germany. In this first and up to now only nationwide study of this phenomenon, he examined psychosocial causes and current developmental trends in this special type of antisocial behavior in the sports context (Lösel, Bliesener, Fischer, & Pabst, 2001). He accompanied this with an analysis of the various prevention and intervention measures designed to address this form of aggressive and antisocial behavior in young men, and he formulated numerous recommendations on how to deal with this problem in society (Lösel & Bliesener, 2003b, 2006).

Since 1999, Friedrich Lösel has been the head of a research team in Erlangen that is studying the development of socio-emotional problem behavior from preschool age onward as part of the first ever longitudinal study of this kind in Germany (the Erlangen-Nuremberg Study). About 850 children and their families are participating in this combined prevention and developmental study that is also creating and evaluating training programs for parents and children. Several studies have confirmed the efficacy of these programs (Beelmann, Jaurisch, Lösel, & Stemmler, 2006; Lösel, Beelmann, Stemmler, & Jaurisch, 2006; Lösel, Stemmler, Jaurisch, & Beelmann, 2009; Stemmler, Beelmann, Jaurisch, & Lösel, 2007). Both differential and cumulative effects could be confirmed that even persisted several years after the end of training. Alongside these effects, it is particularly notable how Friedrich Lösel has striven systematically to ensure that prevention programs are not just tested in a university context and within the framework of pilot studies, but should also be transferred to routine practice. For this purpose, he has built up an advanced training system to ensure that training programs are implemented effectively throughout Germany under the name EFFEKT. Again, this addresses highly topical and relevant research issues, namely, the successful dissemination of programs and the transfer of scientific findings into qualified practice – currently a subject of intensive discussion in international prevention research. The very positive reception of EFFEKT by participants led to further developments such as EFFEKT-Interkulturell for parents and children with a migration background and EFFEKT-E for emotionally stressed parents and their children.

In a further project, funded by the Federal Ministry for the Family, Seniors, Women, and Youth, Friedrich Lösel took a broader look at the field of family services (Lösel, Schmucker, Plankensteiner, & Weiss, 2006). By drawing up a nationwide inventory, he documented the highly complex structure of services resulting from the great diversity of providers and the numerous types of measures, and he classified these according to the services provided and their organizational and theoretical design. As well as systematizing the structure of services, this project is also a fine example of Friedrich Lösel's firm belief in practice based on empirical research: Reviewing the evaluations of such measures formed a major part of this project.

Since 2005, Friedrich Lösel has also been the director of the Institute of Criminology at Cambridge University. Here, he is currently engaged in an international cooperation comparing treatment concepts for children and adolescents with severe socio-emotional problems in different countries. At the same time, he is compiling – in cooperation with the Campbell Collaboration on Crime and Justice – the worldwide research findings on child- and parent-oriented training programs for the prevention of antisocial behavior. The goal of this research team is to promote, provide, and disseminate top-quality and up-to-date reviews of intervention studies that deliver significant support for a crime policy aiming toward reducing crime and promoting procedural justice. Another project on “Risk and Protective Factors During Resettlement of Imprisoned Fathers With Their Families” is being carried out in collaboration with the Ormiston Children and Family Trust.

All these projects and activities had led to an enormous publication outcome. Up to now, Friedrich Lösel has written or edited about 25 books and research reports (e.g., on self-control and delinquency; training of prison officers; psychology and crime; social intervention; meta-evaluation of therapeutic prisons; children at risk; criminal behavior and the justice system; health hazards in adolescents; origins, prevention, and control of violence; psychology and law; residential youth care; football hooliganism; treatment of dangerous offenders; aggression and delinquency in adolescence; assessment and evaluation of family education; and criminology and evidence-based crime policy). He is the author of more than 325 articles and chapters in scientific journals and edited books. He has presented the results of his research in approximately 400 keynote addresses, invited lectures, conference papers, and workshops to both professional colleagues and practitioners in more than 30 countries spread across five continents.

Friedrich Lösel has held and still holds important posts in numerous scientific bodies and associations on both a national and international level. He has been president of the European Association of Psychology and Law; president of the Criminological Society of the German-Speaking Countries; member of the Commission on Violence of the German Federal Government; member of the Executive Committee and chairman of the Psychology and Law Division of the German Psychological Association; visiting fellow of the British Psychological Society; and division secretary of the International Association of Applied Psychology. He has been a member of the scientific advisory boards of the German Criminological Centre, the Netherlands Institute for Criminology and Law Enforcement, and the Max Planck/Minerva Centre

for Youth Problems at the University of Haifa (Israel). He has served as faculty dean at the University of Erlangen-Nuremberg; board member of the family survey of the German Government; reporter on crime problems to the Council of Europe; chairman of the Family Research Award Committee of the German Ministry for Family Affairs; chairman of the Accreditation Committee for programs in psychology and law; member of the Correctional Programmes Accreditation Panel of the Auditor General in Canada; and member of the Effective Interventions Board of the UK Ministry of Justice. The reason for emphasizing these organizations is that they have very close ties with the decision makers on crime policy and they make proposals and recommendations for practice on the basis of the latest research findings throughout the world. He was also vice-chairman of the Scientific Advisory Board of the Max Planck Institute for Foreign and International Criminal Law and chairman of the Board of the Criminological Research Centre of Lower Saxony. Currently, he is member and past chair of the Correctional Services Programme Accreditation Panel in England and Wales, member of the Steering Committee of the Campbell Crime and Justice Group, member of the Advisory Board of the Centre of Evidence-Based Crime Policy at George Mason University (Fairfax, VA), and vice-president of the German Criminological Society. He also serves on other expert panels and more than a dozen editorial boards of national and international journals.

In recognition of his scientific work, he has received various honors including the Award for Lifetime Achievement from the European Association of Psychology and Law, the Sellin-Glueck Award for outstanding international contributions from the American Society of Criminology, and the Stockholm Prize in Criminology, the highest honor of all for criminologists throughout the world awarded by the Swedish Ministry of Justice. In addition, he has been awarded the German Psychology Prize, a Honorary Doctor of Science from Glasgow Caledonian University, and two Honorary Professorships from the Universities of Hangzhou and Chongqing in China. He is also an elected fellow of the Academy of Experimental Criminology.

Through his research and his involvement in various national and international bodies, Friedrich Lösel has always been exceptionally successful in relating psychological findings to socially relevant, applied issues and introducing them to political decision-making processes. However, what is really unique is his ability to engage in research integration: Be it when analyzing and compiling findings from the greatest variety of different approaches to research and different scientific disciplines; be it in working out conclusions that always integrate the perspective of practitioners with their need to react promptly to real-life situations. Nonetheless, throughout his career, he has always stuck firmly to scientifically based recommendations and never lapsed into arbitrary speculation.

Even though Friedrich Lösel will be retiring from his chair at the Institute of Psychology in the Friedrich-Alexander-University Erlangen-Nuremberg in 2011 after 24 years, we can nonetheless rest assured that he will continue to provide his incomparable expertise, his analytical mind, and his always well-founded and valuable recommendations to both the scientific community and practitioners in the field of psychology and law for many years to come.

The present book

This book was based on the idea of depicting the spectrum of Friedrich Lösel's scientific achievements by asking internationally acclaimed colleagues to present the current state of research in their field. This soon reveals the guiding role that Friedrich Lösel has taken in influencing the various research questions, approaches, and models along with his own significant contributions.

The developmentally oriented perspective is becoming increasingly significant in criminology and in research on antisocial behavior. Friedrich Lösel has always been one of the pioneers promoting this perspective. Part I of this book presents a range of current research approaches and models applying the developmental perspective to antisocial and delinquent behavior among the young. First, Richard Tremblay's review impressively shows that developmental trajectories of antisocial behavior from early childhood to adulthood are consequences of genetic and environmental impact. Because of their own developmental history, parents create environments for their offspring that, in turn, determine the development of their brains and their gene expression, thereby influencing not only the development of antisocial behavior but also other individual characteristics (e.g., obesity, allergies, school achievement). However, gene expression is not just determined essentially by parents and particularly by mothers. As children develop, further environments such as the peer group become significant, and partly also through their influence on gene expression. Therefore, he concludes that preventive interventions during pregnancy and infancy should have long-term impacts on numerous physical and mental health problems as well as on social integration. Frank Vitaro and Mara Brendgen follow this with an overview of the different subtypes of aggressive behaviors. They work out major differentiations of aggressive behavior according to its form (physical vs. social aggression) or its function (proactive vs. reactive aggression). The authors analyze the developmental courses of these subtypes of aggressive behaviors, explain their etiology, and describe which consequences they have during the course of development. Rolf Loeber, Helene Raskin White, and Jeffrey Burke review the state of research on developmental pathways in antisocial and delinquent behaviors and their relation to the development of substance use. Developmental pathways refer to the development of different problem behaviors. The authors show how such pathways lead from minor externalizing behaviors to serious property crime, violence, and homicide or between substance abuse and delinquency. Thomas Bliesener then shows how the heterogeneity of previous findings on the developmental paths of delinquency are code-termined by the diversity of the age groups examined, the types of data, and the methods of analysis. Nonetheless, prior research on persistent juvenile offenders also reveals that a merely dichotomous classification of juvenile offenders into one group with a normative adolescence-limited antisocial type and another with a life-course-persistent antisocial type seems inappropriate, and that one can regularly observe not only a late-onset offending type but also one that desists even after persistent and serious offending.

Part II is devoted to research on risk and protective factors for antisocial behavior. David Farrington and Maria Ttofi start with a theoretical chapter that distinguishes between risk, protective, and promotive effects and then applies this conception to data from the Cambridge Study in Delinquent Development. Lea Pulkkinen discusses the

contribution of family factors to the development of antisocial behavior. Using data from her Jyväskylä Longitudinal Study of Personality and Social Development, she presents four different developmental pathways to antisocial behavior and offending. She uses a circumplex impulse control model to sort out the different developmental paths. Per-Olof Wikström elaborates on the impact of social sources on a person's crime propensity as part of his situational action theory. The family, the school, and the neighborhood environment are seen as important social sources that exert important influences on the individual through social cohesion and informal social control. A strongly law-abiding environment lowers a person's crime propensity. The author then presents data from his Peterborough Adolescent and Young Adult Development Study to support his assumptions. Franz Streng elucidates the relationship between media consumption and violence in schools. Based on his own field studies in German schools, he concludes that there is, of course, no clear causal relationship between media consumption and violence, but that media effects are most likely in juveniles who already show a certain level of aggressiveness.

Part III deals with research on the prevention and treatment of antisocial behavior problems and offending from early childhood to adulthood. Andreas Beelmann starts off with an overview on the state of developmental crime prevention, and subjects the currently favored concepts to a theoretical and empirical examination. He then goes on to discuss future research questions and challenges such as the further development of programs and their transfer to the psychosocial care systems. Manuel Eisner and David Humphreys consider how far conflicts of interest can influence results in prevention research. They present an instrument that can be used to assess financial conflicts of interest, and they use meta-analytical data to show that these conflicts should not be underestimated. Mark Lipsey looks at the utility of meta-analytical findings for transferring scientific findings to the practice of offender rehabilitation. He presents methods for systematically integrating meta-analytical results into the planning of juvenile offender services in practice in order to improve the provision of effective treatments. In a programmatic chapter, Lawrence Sherman concludes Part III by asking what the future of offender rehabilitation might look like. Against the background of the most recent trends in the United States and Great Britain, he argues emphatically in favor of an evidence-based offender desistance policing as an alternative to pure imprisonment.

Part IV of this book focuses on forensic-psychological issues regarding diagnosis and prognosis in the legal system. David Cooke starts with an overview on the current state of risk assessment in forensic practice. Alongside the different techniques and procedures developed in recent decades, he points to the various conceptual, statistical, and empirical difficulties confronting current forensic practice. He shows very impressively that although previous methods of risk assessment take a differentiated approach to characteristics of the individual offenders, they tend to neglect the influence of situational factors on individual behavior. He presents his own alternative model that takes these situational factors into account. Ray Corrado also looks at issues in forensic-psychological diagnosis and prognosis. He presents the Cracow Instrument, a comprehensive risk management instrument for serious and violent young offenders. As previous research has shown, developmental trajectories leading to serious and violent offending are determined by a host of risk factors in different phases and walks of life. The Cracow

Instrument assesses these risk factors in the domains of environmental, individual, and family intervention responsiveness along with externalizing behavior from the prenatal phase up to adolescence. Rudolf Egg examines the development and current situation of forensic psychological assessment in Germany. His chapter shows how progress in forensic psychological assessment is based not only on improved practical experience, new techniques, and instruments but also and above all on systematic research. Improvements in forensic-psychological assessment in Germany also arise from the definition of minimum standards of testing by the legislator and from intensifying the training and qualification of forensic psychological experts. In the final chapter in Part IV, Ron Roesch looks at the abilities and capacities of youth in the legal system. He shows how the legal philosophy on how to deal with young offenders as well as legal practices have changed in many countries over the last few decades. He presents current discussions and legal practices regarding how to deal with young offenders in the United States and Canada, and analyzes the developmental issues that impact on youth in the legal and practice domains of arrest and interrogation rights, the competence to stand trial, and mental health needs and treatment.

In Part V, Alexander von Eye, Richard Lerner, Jacqueline Lerner, and Edmond Bowers demonstrate the application of a person-oriented approach in developmental criminology. They compare the statistical method of auto-association configural frequency analysis to latent growth curve modeling using data from the Positive Youth Development Study. They investigate the relationships between youth delinquency and the adolescents' five Cs, that is Competence (in social, academic, cognitive, and vocational domains), (self-)Confidence, Connection (or bonding to peers and family), Character (in terms of adhering to societal and cultural rules), and Caring (as one's sympathy and empathy). Mark Stemmler and Anne Petersen look at girls' problem behavior in terms of legal and illegal drug use and norm-violating behavior. Using data from a 10-year longitudinal study, the Adolescent Mental Health Study, they investigate the relationship between girls' development of psychological adjustment during adolescence (in terms of good academic grades and being popular at school among peers) to norm-violating acts and drug use in young adulthood. In addition, they utilize different types of latent growth curve modeling to explain the heterogeneity of the data. Thomas Cook, Manyee Wong, and Peter Steiner discuss an interesting strategy for evaluating the nationwide program called No Child Left Behind. Although this program was designed to raise academic achievement, its approach could easily be adapted to other domains including those relevant to criminal justice and antisocial behavior in schools. Werner Wittmann demonstrates the usefulness of the principles of symmetry in evaluation research. Based on the ideas of Egon Brunswik, a former teacher of the famous evaluation researcher Donald Campbell, he explains the importance of symmetry in terms of construct validity between the independent and dependent variables.

The 20 contributions to this book reflect only some of the domains and fields of research that Friedrich Lösel has tackled and contributed to in his own work. For us, the editors of this volume, he was also an inspiring teacher and mentor who continuously taught us his guiding principle of applying high methodological standards to the study of societally relevant and demanding research questions and reporting the results back to practitioners.

This book would never have been possible without the support of several generous and patient individuals. Robert Dimbleby and Lisa Bennett from Hogrefe Publishing enthusiastically supported the book project right from the start and gave much valuable help. Jonathan Harrow gave very helpful native speaker advice at any time of the day or night. Tino Dreger never lost patience with our seemingly endless changes and corrections and was always an exceptionally reliable assistant with all the typesetting and layout.

Finally, the team of editors wishes to thank all the contributors to this volume. It was a great pleasure to experience how every single person asked to write a chapter for this Festschrift agreed to contribute immediately and without reservations. It gave us the feeling that their decisions were a matter of pleasure and pride.

Thomas Bliesener, *Kiel*
 Andreas Beelmann, *Jena*
 Mark Stemmler, *Erlangen*

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Contents

Preface	In Honor of Friedrich Lösel <i>Thomas Bliesener, Andreas Beelmann, & Mark Stemmler</i>	V
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Part I Developmental Courses of Antisocial Behaviors

Chapter 1	Environmental, Genetic and Epigenetic Influences on the Developmental Origins of Aggression and other Disruptive Behaviors <i>Richard E. Tremblay</i>	3
Chapter 2	Subtypes of Aggressive Behaviors: Etiologies, Development, and Consequences <i>Frank Vitaro & Mara Brendgen</i>	17
Chapter 3	Developmental Sequences and Pathways Towards Serious Delinquency and Substance Use <i>Rolf Loeber, Helene Raskin White, & Jeffrey D. Burke</i>	39
Chapter 4	Persistent Juvenile Offenders <i>Thomas Bliesener</i>	53

Part II Risk and Protective Factors in Antisocial Behaviors

Chapter 5	Protective and Promotive Factors in the Development of Offending <i>David P. Farrington & Maria M. Ttofi</i>	71
Chapter 6	Family Factors in the Development of Antisocial Behavior <i>Lea Pulkkinen</i>	89
Chapter 7	Social Sources of Crime Propensity: A Study of the Collective Efficacy of Families, Schools, and Neighbourhoods <i>Per-Olof H. Wikström</i>	109
Chapter 8	Media Consumption and Violence in Schools <i>Franz Streng</i>	123

Part III Crime Prevention, Offender Treatment, and Rehabilitation

Chapter 9	The Scientific Foundation of Prevention: The Status quo and Future Challenges for Developmental Crime Prevention <i>Andreas Beelmann</i>	137
Chapter 10	Measuring Conflict of Interest in Prevention and Intervention Research: A Feasibility Study <i>Manuel Eisner & David Humphreys</i>	165
Chapter 11	Effective Interventions for Juvenile Offenders: Using Meta-Analysis to Bridge from Research to Practice <i>Mark W. Lipsey</i>	181
Chapter 12	Offender Desistance Policing (ODP): Less Prison and More Evidence in Rehabilitating Offenders <i>Lawrence W. Sherman</i>	199

Part IV Risk Management and Criminal Justice

Chapter 13	Violence Risk Assessment: Things that I Have Learned So Far <i>David J. Cooke</i>	221
Chapter 14	Comprehensive Risk Management Instruments for Serious and Violent Young Offenders: Challenges and Advantages <i>Raymond R. Corrado</i>	239
Chapter 15	Forensic Psychological Assessment in the Criminal Justice System: Development and Perspectives in Germany <i>Rudolf Egg</i>	261
Chapter 16	Young Offenders and Legal Competencies <i>Ronald Roesch</i>	275

Part V Research Methods in Developmental Criminology

Chapter 17	The Development of Delinquent Behavior: Variable- and Person-Oriented Methods of Analysis <i>Alexander von Eye, Richard M. Lerner, Jacqueline V. Lerner, & Edmond P. Bowers</i>	293
Chapter 18	Latent Growth Curve Modeling and the Study of Problem Behavior in Girls <i>Mark Stemmler & Anne C. Petersen</i>	315
Chapter 19	Evaluating a National Program: Effects of No Child Left Behind on Math Achievement in the United States <i>Thomas D. Cook, Manyee Wong, & Peter Steiner</i>	333
Chapter 20	Principles of Symmetry in Evaluation Research with Implications for Offender Treatment <i>Werner W. Wittmann</i>	357
	List of Contributors.....	369
	Subject Index	373

Part I

Developmental Courses of Antisocial Behaviors

Chapter 1

Environmental, Genetic, and Epigenetic Influences on the Developmental Origins of Aggression and Other Disruptive Behaviors

Richard E. Tremblay

This chapter summarizes evidence indicating that: (a) developmental trajectories of disruptive behaviors (DB) from early childhood to adulthood are the consequence of genetic and environmental endowment; (b) the early environment is created by the parents' own developmental history and has a major impact on DB through its impact on gene expression and brain development; (c) mothers appear to have the greatest impact on early gene expression; (d) as children grow older the larger environment (e.g., peers) has an impact on DB, partly through gene expression. I conclude that the genetic and environmental effects on DB development probably also have numerous other negative effects, such as mood disorders, obesity, allergies, asthma, substance use, school achievement, unemployment. Thus, preventive interventions during pregnancy and infancy should have long term impacts on numerous physical and mental health problems as well as social integration.

Introduction

The aim of this chapter is, first to summarize the relatively few studies on risk factors associated with early chronic trajectories of aggression and other disruptive behavior, and second to discuss the putative early causal mechanisms based on a wider range of recent animal and human studies.

To put these two aims in perspective I first summarize the present state of knowledge on developmental trajectories of aggressive and other disruptive behaviors (DB) (see Tremblay, 2010). Longitudinal studies from early childhood on the two overt be-

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havioral categories (physical aggression and opposition-defiance) and the two covert behavioral categories (rule breaking and theft-vandalism) indicate that the frequency of overt behavior generally decreases with age while the frequency of covert behavior generally increases with age. Indirect aggression also increases with age (Côté, Vaillancourt, Barker, Nagin, & Tremblay, 2007; Keenan, Coyne, & Lahey, 2008). These developmental differences are not surprising when we consider the behavioral impact of brain maturation which increases the ability to inhibit impulses with age. Because aggregated scales of conduct problems or antisocial behavior have been the norm, very few studies have addressed these issues (Barker et al., 2007). The available studies suggest very strongly that the *a priori* developmental taxonomy “early and late onset” of conduct disorder or antisocial behavior (American Psychiatric Association, 2000; Barker & Maughan, *in press*; Moffitt & Scott, 2008) confounds early development of overt DB and later development of covert DB. The aggregation of overt and covert DB also masks the timing of the appearance and disappearance of important sex differences.

Most studies indicate that males are largely over-represented in the chronic trajectories of each DB categories (e.g., Côté, Vaillancourt, LeBlanc, Nagin, & Tremblay, 2006; NICHD Early Child Care Research Network, 2004; Tremblay et al., 2004). The best available data is for aggression. Sex differences increase with age, however these tendencies are inverted for overt (physical) and covert (indirect) aggression (Côté, 2007). Girls appear to learn the covert aggression strategy earlier and increase their frequency up to late adolescence. These sex differences can best be observed among the chronic cases. Physical violence of females during adolescence is generally so rare that modeling their developmental trajectories fails (Barker et al., 2007). Thus the differences in type of aggression between males and females are at their peak when they start mating (Archer, *in press*; Archer & Côté, 2005).

Comorbidity is ubiquitous among mental disorders, and this is true for preschoolers as well as school age children (Costello, Mustillo, Erkanli, Keeler, & Angold, 2003; Egger & Angold, 2006). However, high comorbidity did not prevented the creation of disorders that are meaningful for the advancement of research, prevention and treatment (Angold & Costello, 2009). The same logic should apply to disruptive behaviors. It is not surprising that comorbidity is strong among individuals who have serious problems with physical aggression, opposition, defiance, rules, theft and vandalism, but aggregating all disruptive behaviors does not make sense for research nor clinical purposes. First, there is good psychometric evidence of significant differences between these types of behavior at a given point in time (Frick et al., 1993). Second, the developmental trajectories reviewed above evince that there are also important developmental differences. Finally, taxonomies are meant to guide treatment; if the same diagnosis is given to individuals who, for example, have theft problems only, those that simply break age appropriate rules and those who have a serious physical aggression problem it is unlikely that we will find the adequate treatment for each category. This is obviously also true for the emotional and cognitive dimensions of these problems which, for example, lead to more or less proactive and reactive aggressions (Barker, Tremblay, Nagin, Vitaro, & Lacourse, 2006; Frick & Viding, 2009; Vitaro, Barker, Boivin, Brendgen, & Tremblay, 2006).

Risk factors and causal mechanisms

I have focused this section on perinatal and intergenerational causal mechanisms because, from the present state of knowledge, they appear more likely than proximal events to be at the origin of chronic trajectories of DB during infancy. This focus on very early risk factors and causal mechanisms is in itself of interest, but especially crucial to finding long lasting effective preventive interventions (Tremblay, 2010).

Genetic risk factors

Family transmission studies of DB behavior problems using twins and parent-offspring designs suggest strong general heritability for children and adolescents (e.g., Hicks, Krueger, Iacono, McGue, & Patrick, 2004; Scourfield, Van den Bree, Martin, & McGuffin, 2004). For example, a study of 17 year old twins ($n = 542$) and their biological parents concluded that the mechanism underlying the familial transmission of conduct disorder, adult antisocial behavior, alcohol dependence and drug dependence was “primarily a highly heritable general vulnerability”. The heritability index (h^2) was indeed 0.80 (Hicks et al., 2004). If different disorders such as CD and alcohol dependence have such strong common genetic causes, it would not be surprising that the different types of DB have common genetic risk factors. However, this commonality in genetic risk does not mean that other genetic and environmental risk factors are not involved. The common genetic risk factors may explain vulnerability for DBs, but other genetic and environmental factors may lead to different forms of DBs. The form of DB expressed by individuals with the inherited vulnerability could depend on other heritable traits such as personality (e.g., extraversion vs introversion), cognitive functioning (e.g., low-high IQ), body size (small-big), and environmental factors such as opportunities for given types of DB (overt-covert) (Hicks et al., 2004).

Most of the genetically informative studies of DB during early childhood aggregated the different types of DB. These studies of aggregated “antisocial” and “externalizing” scales, mostly with twins, found extremely high heritability estimates (up to 82%) (e.g., Van den Oord, Koot, Boomsma, Verhulst, & Orlebeke, 1995; van der Valk, van den Oord, Verhulst, & Boomsma, 2001). However, one twin study that disaggregated physical aggression and disregard for rules during early childhood suggests that genetic and environmental contributions vary according to the DB dimension and the age of the children: On the one hand, genetic contribution to frequency of physical aggression at 19 and 72 months did not vary substantially (58% and 66% respectively; Dionne, Tremblay, Boivin, Laplante, & Pérusse, 2003; van Lier et al., 2007), on the other hand, genetic contribution to frequency of disregard for rules at 20, 50 and 64 months was substantially lower and varied more with age: 17%, 37%, and 30% respectively (Pettitclerc & Tremblay, 2009). Interestingly, although genetic contribution to frequency of disregard for rules was relatively low, it accounted for most of the stability in disregard for rules between 20 and 64 months.

Clearly, genetically informative longitudinal studies from early childhood to adulthood are needed to understand the developmental origins of the different types of DB.

Such studies provide crucial information on the source of variation at a given point in time and over time. They can also provide information on the causal interplay between the different behavioral dimensions. A recent sibling analysis with a large longitudinal study is a good example (Lahey et al., 2008). The aim of the study was to investigate to what extent genetic and environmental factors explained links between ODD, ADHD, and CD at two developmental periods (4–7 and 8–13 years). Results showed that ODD and ADHD between 4 and 7 years did not predict the change in CD between 4–7 and 8–13 years, once genetic and environmental factors had been taken into account. These results suggest that ODD and ADHD are not early developmental precursors of the broad CD category. Twin and sibling studies should use this strategy with the different dimensions aggregated under the CD label: Aggression, lying, cheating, disobedience, vandalism, lack of remorse (e.g., Baker, Raine, Liu, & Jacobson, 2008; Tuvblad, Zheng, Raine, & Baker, 2009). The developmental trajectories described above clearly suggest that different genetic and environmental factors are involved at different developmental periods for different types of DB. Hypotheses concerning developmental causal effects of a given type of disruptive behavior on another type (Loeber & Stouthamer-Loeber, 1998) can be tested with these genetically and developmentally informative designs (Lahey, D’Onofrio, & Waldman, 2009).

Environmental risk factors

Not surprisingly, studies of environmental risk factors for early childhood chronic DB trajectories are concentrated on the overt DB type: Three studies targeted physical aggression (Côté et al., 2006; NICHD Early Child Care Research Network, 2004; Tremblay et al., 2004) and one targeted disregard for rules (Petitclerc, Boivin, Dionne, Zoccolillo, & Tremblay, in press). The four studies used four different samples which included a total of more than 14,000 children. However, these studies were not done in the context of a genetically informative design, hence we do not know to what extent the significant environmental risk factors are correlated or interact with genetic factors (Plomin, 1994; Szyf et al., 2009). Nonetheless, the environmental risk factors identified by these studies can be used to identify at risk groups for preventive experiments. Such experiments are useful to test the effectiveness of the intervention as well as test causal hypotheses (Schwartz, Flamant, & Lelouch, 1981; Tremblay, 2003).

Significant early risk factors found using multivariate analyses with the three physical aggression studies and the disregard for rules study can be grouped into four categories: Maternal characteristics-life style-mental health, family characteristics, maternal parenting, child characteristics. Maternal and family characteristics are key for preventive interventions because they can be used to identify at risk pregnant women (e.g., Olds et al., 1998). Mother’s young age at birth of her child (first or target child in the study), mother’s antisocial behavior during adolescence, mother’s depression, and mother’s low level of education were all found to be significant risk factors in at least two of the four studies, while mother smoking during pregnancy was found in one study. Family low income was a risk factor in all three studies on physical aggression, but not in the rule breaking study. Family dysfunction, lack of stimulation and the presence of sib-

lings were significant risk factors in one of the studies on physical aggression. Mother's hostile-coercive parenting was a significant risk factor in two of the aggression studies while male children were found to be at highest risk of being on the chronic trajectory in all four studies.

Knowledge of the risk factors for chronic trajectories of DB during early childhood is clearly based on a small number of studies. Fortunately, these studies included large representative samples of the population with frequent repeated assessments over many years. There is much convergence among the studies as well as convergence with studies of chronic trajectories for older children. Differences among studies can be due to differences in the variables studied, differences in the way variables are assessed and differences in samples.

Early risk factors are useful to find early causal mechanisms and guide early preventive interventions. An interesting question is the extent to which early risk factors for early overt DB problems are similar to those for a somewhat different diagnosis. In one study of early risk factors for the chronic trajectory of hyperactivity between 2 and 7 years found the same risk factors: Maternal prenatal smoking, maternal depression, early hostile parenting practices and male child (Romano, Tremblay, Farhat, & Côté, 2006). These early risk factors are also similar to those found for the CD "problem" trajectories in the Dunedin longitudinal study (Odgers et al., 2008): Low socioeconomic status, mother mental health, mother IQ, parental conviction, inconsistent discipline and maltreatment (see also Moffitt & Scott, 2008; Robinson et al., 2008).

Can we expect different factors for covert DB? Similarities in early risk factors for CD, ADHD and overt DB may be due to the fact that they are all highly loaded on overt-externalizing behaviors. Unfortunately, the lack of early developmental trajectories for the covert DB and consequently lack of risk studies prevent understanding to what extent there are different early risk factors for overt and covert DB as well as for destructive and non destructive DB. For example, it would be useful to know if there are prenatal characteristics that distinguish individuals on chronic trajectories of physical aggression from those on chronic trajectories of theft, since they appear to have different cognitive development (Barker et al., 2007)? Are there common early parent-family environment problems with all these early chronic trajectories which become diversified because of later environmental "determinants" or do we have common environments and different genetic profiles which puts individuals on an overt versus a covert track and a destructive versus non destructive track? Teasing out the common and unique risk factors will involve differentiating "pure" from "comorbid" groups. As discussed below, experimental preventive interventions may be the best approach to understand the links between the risk factors and the different types of developmental trajectories.

Bio-psycho-social causal mechanisms

We have seen above that there is accumulating evidence of strong effects on the development of DB from both environmental and genetic factors. However, most if not all of this evidence does not specify the mechanisms involved. The genetic evidence comes

mostly from twin studies which attempt to statistically partition genetic and environmental contributions without identifying specific genes or environmental conditions. The identified environmental risk factors come mostly from correlational studies which cannot test causal mechanisms. In this section we review studies which may help identify more precisely the bio-psycho-social mechanisms involved in placing children on chronic trajectories of DB from early childhood onwards.

Molecular genetic studies

Over the past two decades numerous studies identified genes which appear to play a role in the development and maintenance of mental illnesses. A number of these studies identified genes associated with DB, mostly genes involved in dopamine and serotonin neurotransmission. For example, the 7-repeat allele of the dopamine D4 receptor gene was found to be associated with impulsivity, poor executive function and to moderate the association between externalizing behavior and cognitive ability (DeYoung et al., 2006; Forbes et al., 2009; Kluger, Siegfried, & Ebstein, 2002).

Numerous studies are showing that phenotypic variations can best be accounted by studying simultaneously genetic and environmental characteristics. Primate experiments with maternal deprivation showed the advantage of looking at gene-environment interactions (e.g., Bennett et al., 2002; Champoux et al., 2002), while correlation studies with humans suggested that violent behavior in humans was more frequent for males who were maltreated during childhood when they had a genotype conferring low MAOA activity (Caspi et al., 2002). However, further studies indicate that these gene-environment statistical interaction may depend on age, severity of maltreatment, situational factors, and may apply to many other types of behavior problems (e.g., McDermott, Tingley, Cowden, Frazzetto, & Johnson, 2009; Tikkanen et al., 2009; Weder et al., 2009).

Interestingly, one study disaggregated DB into overt (aggression in the TRF) and covert (delinquency in the TRF) with a sample of 5 to 15 year old children removed from their parent's care (Froehlich et al., 2007). Investigators also assessed four levels of trauma exposure. Results showed important differences between overt and covert DB. No protective effect of high MAOA activity was observed for covert DB. The expected protective effect was observed for overt DB, but only at low and moderate levels of trauma exposure. Results were still more complex for inattention. High MAOA protective effects were observed at low levels of adversity while low MAOA protected from severe levels of trauma. In another recent paper on adopted children (van der Vegt et al., 2009) finding suggested that individuals with high MAOA activity were more at risk of high externalizing (CBCL aggression and delinquency scales) and that there was no interaction between maltreatment and MAOA.

Obviously, by studying the statistical interaction of one gene with one environmental characteristic at a time we are very far from unraveling the innumerable statistical and bio-psycho-social interactions between thousands of genes and thousands of environmental conditions which lead to thousands endophenotypes and phenotypes in a given individual. A meta-analysis of a simple GxE interaction (one gene x one dichotomized environmental condition) for depression highlights the dangers of this piecemeal enter-

prise (Risch et al., 2009). The meta-analysis, which included 14 studies with a total of 14,250 subjects, concluded that there was no evidence of an association (main effect or interaction effect) between the serotonin transporter genotype and depression for men, women and for both sex combined. The authors warned that rates of false positives are likely to be high when candidate genes do not have strong main effects (see also Munafo, Durrant, Lewis, & Flint, 2009). This is especially true for mental illnesses in general and DB in particular because our taxonomies have weak classification criteria and poorly defined etiologies. From this perspective, developmental trajectories based on repeated assessments from early childhood to adolescence should help create better classification criteria and identify etiologies because they take into account more of the developmental information than traditional diagnoses and simple a priori early–late onset dichotomies. We also need to better define the environments over time. Taking into account environment and genetic information was an important step forward, but from a developmental perspective it does not make much sense to characterize an individual’s environment over a 15 to 20 year period as having been maltreating or not (e.g., van der Vegt et al., 2009).

There is wide consensus that complex disorders, such as mental illnesses, are based on the interaction of numerous genes and numerous environmental factors. If this is the case it is highly unlikely that a single gene interacting with a single environmental characteristic would be a useful explanation of a complex disorder, let alone its development. One of the main lessons here is that simple hypothesis driven traditional research is unlikely to find a needle in a haystack; the other main lesson is that we need numerous replications before we can claim a significant advance in our understanding of the mechanisms leading to mental illnesses. Any “new” finding should modestly be considered the result of an exploratory study until it is replicated numerous times. Indeed, we may find ways to prevent the disorders before we find their causal mechanisms through correlation studies (Tremblay, 2003).

Epigenetic studies

Four years after Darwin published “On the Origin of Species” (1859), the French naturalist Quatrefages (1863) wrote: “Nowadays I admit, with everybody, the doctrine of epigenesis. Every normal egg which gives birth to an abnormal individual is influenced by external agents whatever they are; this is what I call action of the milieu”. Approximately 100 years later C. H. Waddington created the first “modern” Epigenetic laboratory at the University of Edinburgh and had a moment of glory before the tremendous explosion of molecular genetics (Goldberg, Allis, & Bernstein, 2007). Epigenetics re-emerged with the study of gene expression mechanisms.

The term “epigenetic” now refers to the mechanisms which program genes and can have a stable and lasting change in gene function without modifying its sequence (mainly changes in DNA methylation and chromatin structure). This programming is responsive to environmental effects, especially during fetal and early post natal development. Thus, environments can impact phenotypes through their chemical impact on programming of gene function (Mill & Petronis, 2008; Szyf et al., 2009). Epigenetic effects are

well known in cancer research (Szyf, 2003) and have recently been shown to possibly play an important role in the obesity epidemic we are facing (Waterland, 2009) and in behavior regulation (Meaney & Szyf, 2005; Szyf et al., 2009).

To grasp the potential contribution of epigenetics to the mechanisms involved in early development of DB it is important to understand the difference between the traditional gene-environment interaction story and the epigenetic story. To explain key differences I will use two studies which attempt to explain the effects of a maltreating environment on development. Let's start by the gene-environment statistical interaction story of MAOA described above. Males brought up in a "maltreating" environment were observed to be more at risk of violent behavior if they had a short rather than a long allele on the promoter region of the MAOA gene. In this example, the maltreating environment does not physically interact with the MAOA gene. The interaction is statistical i.e., obtained from a 2x2 table comparing four groups created from two variables: Maltreating-not maltreating and short-long MAOA allele. It is presumed that individuals who inherited either short or long alleles react differently to the maltreating environment because their neural system functions differently and such differences are due to MAOA activity.

Epigenetic studies have a different approach; they focus specifically on the physical effects of the environment on gene expression at a given moment in time. The classic example for effects of neglectful environments comes from an experimental study of maternal behavior in rats which showed that rat pups insufficiently licked by their mothers in the days following birth (i.e., neglected) exhibit increased methylation of the gene encoding for the Glucocorticoid receptor in the hippocampus, resulting in reduced expression (Weaver et al., 2004; Weaver, Meaney, & Szyf, 2006). The study further showed that this gene methylation effect had downstream effects on the hypothalamic-pituitary-adrenal axis which regulates stress responses in the body. More recently a study of maternal separation at birth with mice showed DNA methylation alterations associated with chronic hypersecretion of corticosterone, problems with stress coping and memory (Murgatroyd et al., 2009).

Epigenetic mechanisms are especially important because they provide a powerful explanation for maternal transmission of disorders discussed above that extend beyond the traditional genetic transmission explanations. Furthermore, DNA methylation changes over time can be used as markers of environmental effects during development, including assessment of preventive and corrective intervention effects.

The discussion of early risk factors above showed that chronic forms of DB are specifically related to maternal characteristics: Maternal age at first pregnancy, history of behavior problems, education, smoking, depression, coercive parenting, etc. This can easily be understood from the traditional environmental perspective: A poor early environment has an impact on the developing foetus and infant. Mother characteristics turn out to be more important risk factors than father characteristics because the former carry the child in their womb during fetal life and are more involved in care giving during early childhood. However, the exact bio-psycho-social mechanisms linking poor quality environment to disorganized behavior remain unclear, to say the least.

The epigenetic story provides a basic mechanism that met much disbelief (and still does) but has the advantage of being parsimonious, testable, and promising for preventi-

on. The most fascinating aspect of this mechanism is that it provides an environmentally based explanation of intergenerational transmission for physical and mental disorders which involves genes but is not genetically transmitted. These mechanisms are still far from being clearly understood, but they provide a challenging alternative perspective to the traditional gene vs environment and gene-environment interaction hypotheses (McGowan, Meaney, & Szyf, 2008; Ruten & Mill, 2009).

Interesting examples of epigenetic mechanisms are now available from the nutrition and obesity literature (Waterland, 2009). These epigenetic effects of prenatal nutrition are probably linked to DB, but the best example for DB is the link between quality of early environment and development of the HPA axis first shown with the rat experiments discussed above and recently applied to humans. In a study of brains from individuals who committed suicide, epigenetic differences were observed in a neuron-specific glucocorticoid receptor promoter when three groups were compared: Significant differences in methylation was observed when the brains of those who committed suicide and had been abused during childhood were compared to the brains of those who were not abused, and those of a group that had died in a car accident (McGowan et al., 2009). A pilot study (Szyf et al., 2009) is also indicating differences in methylation profiles from blood samples of males on chronic and normal trajectories of physical aggression.

A key hypothesis from cross-fostering and epigenetic studies bearing on the idea of early and intergenerational prevention is that environmental effects are transmitted inter-generationally, and most clearly from mothers to daughters (Champagne & Meaney, 2001; Diamond, 2009; Fish et al., 2004; Meaney, 2001). In its simplest form it is easy to understand that if maternal life style (eating, drinking, smoking, stress, depression) during pregnancy has an epigenetic effect on the daughter's brain development and functioning, the daughter who is likely to live in an environment similar to her mother's will have a similar life style during her own pregnancies, and so on from generation to generation (Gluckman et al., 2009).

Conclusions

This chapter has summarized evidence indicating that: (i) developmental trajectories of DB from early childhood to adulthood are the consequence of genetic and environmental endowment; (ii) the early environment is created by the parents' own developmental history and has a major impact on DB through its impact on gene expression and brain development; (iii) mothers appear to have the greatest impact on early gene expression; (iv) as children grow older the larger environment (e.g., peers) has an impact on DB, partly through gene expression; (v) the genetic and environmental effects on DB development also have numerous other negative effects, such as mood disorders, obesity, allergies, asthma, substance use, school achievement, unemployment.

Thus, the available evidence suggests that the easily identifiable early environmental risk factors for the different DB are similar and relate most strongly to the mother. Most of these risk factors can be identified prior to or at the start of pregnancy: Mother's behavior problems during adolescence, poor education, first pregnancy at a young age, de-

pression, smoking, dysfunctional relations with the father, and poverty. Sex of the child, a genetic characteristic, is by far the most robust predictor. There is also good evidence from quantitative genetic studies (mainly twin studies) and molecular genetic studies that genetic factors are strongly implicated in effects that can be observed soon after birth. New evidence from gene expression studies (epigenetics) suggest that the numerous environmental risk factors related to the mother may start to have their impact on the child's developing brain and eventual self control problems during fetal life, and soon after, through their impact on gene expression. Because we do not observe DB problems during fetal life, and because traditionally we did not study DB problems during early childhood, our interventions targeted the nocive environment very far downstream after the original damage was done. From an epigenetic perspective, that damage is carried throughout development by genetic programming. It will be important to unravel the intricacies of that mechanism during the perinatal period, but all the evidence suggest that preventing the development of serious DB problems should start at conception, at the latest, and needs to target females who have a history of social adjustment problems. In essence we need to turn on its head our thinking about prevention of DB: Males are much more affected, but females should be our prime target to prevent a new generation of males and females with DB. It is clear that the perinatal bio-psycho-social environment which impacts gene expression is very largely related to pregnant women's health status and life style. This epigenetic perspective suggests that successful prevention of DB may be easier to achieve by ameliorating the early environment rather than chasing bad genes (Bernet, Vnencak-Jones, Farahany, & Montgomery, 2007; Gluckman, Hanson, Cooper, & Thornburg, 2008). In case these conclusions are read as blaming mothers for their children's behavior problems, I will emphasize that mothers, fathers and children should not be blamed for the genes and the environment they receive at conception. The main argument here is that we probably need to give intensive support to parents from conception, at the latest, to help children become more responsible and prevent other generations of victims.

Notes

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