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Practitioner Review: Effective ingredients of prevention programs for youth at risk of persistent juvenile delinquency – recommendations for clinical practice

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Background: There is a lack of knowledge about specific effective ingredients of prevention programs for youth at risk for persistent delinquent behavior. The present study combines findings of previous studies by examining the effectiveness of programs in preventing persistent juvenile delinquency and by studying which particular program, sample, and study characteristics contribute to the effects. Information on effective ingredients offers specific indications of how programs may be improved in clinical practice. **Method:** A literature search in PsychINFO, ERIC, PubMed, Sociological Abstracts, Criminal Justice Abstracts, and Google Scholar was performed. Only (quasi) experimental studies and studies that focused on adolescents at risk for (persistent) delinquent behavior were included. Multilevel meta-analysis was conducted on 39 studies ($N = 9,084$). Participants' ages ranged from 6 to 20 years ($M = 14$ years, $SD = 2.45$). **Results:** The overall effect size was significant and small in magnitude ($d = 0.24$, $p < .001$). Behavioral-oriented programs, focusing on parenting skills training, behavioral modeling, or behavioral contracting yielded the largest effects. Multimodal programs and programs carried out in the family context proved to be more beneficial than individual and group-based programs. Less intensive programs yielded larger effects. **Conclusions:** Prevention programs have positive effects on preventing persistent juvenile delinquency. In order to improve program effectiveness, interventions should be behavioral-oriented, delivered in a family or multimodal format, and the intensity of the program should be matched to the level of risk of the juvenile. **Keywords:** Effectiveness, prevention, juvenile delinquency, meta-analysis.

Introduction

Juvenile delinquency is an important societal problem, with negative emotional, physical, and economic consequences for individual victims, local communities, and society as a whole. Moreover, juvenile offending is associated with poor health outcomes, and educational, vocational and interpersonal problems in juvenile offenders themselves (Borduin, 1994; Kazdin, 1987). In particular, the relatively small group of persistent offenders warrants attention. These youths start committing delinquent acts at an early age, their behavior becomes gradually more disruptive, and offending continues into adulthood (Loeber, Burke, & Pardini, 2009). During early adolescence, these youngsters are exposed to negative peer influences, a starting point for further escalation of problems, they are at high risk for school failure, disengagement from society and involvement in criminal activities in later adolescence and adulthood (Odgers et al., 2008). It is therefore important to establish how juveniles with disruptive behavior problems, who are at risk for becoming a persistent delinquent, can best be prevented from developing a chronic criminal career.

The majority of meta-analytic reviews have focused on a broad range of juvenile offenders, ranging from mild to severe delinquents (e.g. Lipsey, 2009; Wilson, Lipsey, & Soydan, 2003), or on severe and chronic juvenile offenders (e.g. James, Stams, Asscher, De Roo, & Van der Laan, 2013; Landenberger & Lipsey, 2005), which limits generalizability to youth at the onset of a criminal career. Therefore, we examine the effectiveness of prevention programs for juveniles at the onset of a criminal trajectory and at risk for persistent offending. These programs usually target youths showing early indications of disruptive behavior problems, who may have committed minor offenses, but who have not yet exhibited a longstanding pattern of severe antisocial and delinquent behavior (Greenwood, 2008; Mulvey, Arthur, & Reppucci, 1993).

A large amount of meta-analyses were directed to one format or type of program targeting antisocial or delinquent behavior (i.e. juvenile offender recidivism), such as cognitive-behavioral therapy (Landenberger & Lipsey, 2005; McCart, Priester, Davies, & Azen, 2006), skills training (Ang & Hughes, 2001; Lösel & Beelmann, 2003), family treatment (Farrington & Welsh, 2003; Latimer, 2001), victim–offender mediation (Bradshaw, Roseborough, & Umbreit, 2006; Nugent, Williams, &

Umbreit, 2004), wilderness challenge programs (Wilson & Lipsey, 2000), or specific therapies, such as Multisystemic Therapy (Henggeler, Melton, Brondino, Scherer, & Hanley, 1997). In contrast with these earlier review studies, the present meta-analytic study is focused on identifying specific program components of preventive interventions for delinquent behavior, such as 'conflict resolution' or 'behavioral modeling', that contribute to program effectiveness. Only Landenberger and Lipsey (2005) found that cognitive-behavioral programs including anger control and interpersonal problem solving, but not victim impact or behavior modification components, were related to higher recidivism reductions. However, this meta-analysis focused on severe adult and juvenile offenders.

Although previous research has identified effective programs targeting juvenile delinquency, recidivism in particular, it is still unknown which types or components of preventive programs are most effective for whom at the onset of a criminal career. Mulvey et al. (1993) narratively reviewed the effectiveness of prevention programs for youths with only one or two police contacts, but who had not yet been adjudicated by the juvenile court. Positive effects were found for diversion programs, indicating that well-implemented programs, incorporating behavioral and family based change strategies, generated reductions in subsequent arrest rates. Other clear evidence of effectiveness was found for behavioral, structural, and multisystemic family therapy. However, these results were based on a narrative review and should therefore be interpreted carefully. Qualitative (narrative) reviews, although informative, lack explicit systematic procedures and detailed analysis of which study characteristics explain differences in study outcomes (Lipsey & Wilson, 2001). The method of quantitative review is especially useful to identify moderator effects, that is, specific participants and/or program characteristics that may influence the success of an intervention, which are likely to remain invisible in single studies examining effectiveness of preventive programs due to small sample sizes or a lack of variation in these characteristics.

Promising results of family based programs were confirmed by a recent meta-analysis of Schwalbe, Gearing, MacKenzie, Brewer, and Ibrahim (2012), revealing that family based diversion programs resulted in a reduction of recidivism. However, the overall effect of diversion programs on recidivism was nonsignificant. In contrast, Wilson and Hoge (2012) found that diversion programs were significantly more successful than the traditional justice system, but differences were no longer significant when a successful research design was used [e.g. randomized controlled trial (RCT), or successful matched control design, independency of researchers]. Although diversion programs are mainly designed for status and first time offenders diverted

from the juvenile justice system, the studies of Schwalbe et al. and Wilson and Hoge also included high risk, chronic or serious offenders. Since juveniles at the onset of their criminal career may have been formally adjudicated by the court, as a result of committing minor offenses, we are also interested in the effectiveness of a broader set of programs for less serious juvenile offenders who have been referred by the juvenile court.

Review aim

In sum, previous research has provided information on the effects of curative (judicial) interventions aimed at a broad target group, ranging from mild to severe juvenile offenders. As mentioned in the previous paragraph, most meta-analytic reviews have focused on specific types of programs targeting juvenile offender recidivism. However, to our knowledge, to date there are no meta-analytic reviews that examined to what extent prevention programs in general are effective in preventing juveniles to start or continue a criminal trajectory. Therefore, there is only scant knowledge of which particular program, sample, and study characteristics contribute to larger program effects for the target group. For example, it is unknown whether community-based programs are more effective than prevention programs in a court setting, or whether younger adolescents benefit more than older adolescents or young adults. Programs targeting juveniles at risk for delinquency are likely to be more cost-effective than universal programs that focus on general populations (Greenwood, Model, Rydell, & Chiesa, 1998). Therefore, a systematic review of the effectiveness of prevention programs for youth at the onset of a criminal career is warranted.

The present meta-analysis evaluates *prevention programs* targeting juveniles identified as being at increased risk for a persistent delinquent behavior pattern, allowing an integrated analysis of comparative effectiveness of different programs and approaches (following Lipsey, 2009). The main purpose of this study is to examine the overall effect of prevention programs for persistent juvenile delinquency, and to examine how effectiveness of these programs is influenced by the type and intensity of the program, characteristics of the participants, design of the study, and type of outcome. Identification of effective program ingredients can help improve interventions for the prevention of persistent delinquent behavior in at-risk youths.

Methodology
Inclusion criteria

Studies were selected if they met four main criteria. First, the central outcome measures in this meta-analysis had to be delinquency, criminal

offending, or recidivism. Studies were included if at least one quantitative outcome measure of delinquency was reported. Studies that focused exclusively on a general category of problem behavior, such as externalizing problems (antisocial or conduct problems) were not included. Delinquency was defined as illegal behavior, prohibited by the law. Recidivism was defined as the second or repeated offense known to the police and court authorities.

Second, studies that involved at-risk youth, with ages 8–20 years at the start of the program as treatment and comparison participants, were included. This target group can be described as youths at risk for a persistent delinquent behavior pattern, such as predelinquents with antisocial behavior, first time offenders and delinquents with mainly minor police contacts and offenses (theft, vandalism, menacing). Although rates of delinquency are highest in youths between ages 12 and 20 years, programs targeting youths from 8 to 12 years were also included, because the present study is focused on prevention programs that could also be designed for school-aged predelinquents. Moreover, it is known that a substantial percentage of these youngsters already come into contact with the police and justice (Snyder, 2001). Studies examining interventions targeting serious, persistent or chronic offenders and incarcerated juveniles (convicted of major offenses, such as violence, murder, forcible rape, armed robbery) were excluded.

Third, we focused on selective and indicated prevention programs that were developed for juveniles at risk for (the progression of) delinquent behavior. The target group of selective prevention consists of juveniles whose risk of developing mental disorders is significantly higher than average. Indicated prevention is focused on high risk juveniles who are identified as having minimal but detectable symptoms of mental disorders (prior to the diagnosis of a disorder). Universal prevention programs, targeting a general population that has not been identified on the basis of individual risk, were excluded (O'Connell, Boat, & Warner, 2009).

Fourth, to maximize research quality, only studies with an experimental (RCT) or quasi-experimental design (in which a treatment condition is compared to a control condition) were included. Nonequivalent comparison designs, in which groups were not randomly assigned to conditions, were included only if a pretest measure of delinquency or antisocial behavior or a variable highly correlated with delinquency (e.g. prior delinquency history) was used. One group pretest–posttest designs were excluded. Finally, studies based on interventions carried out before 1950 were not included.
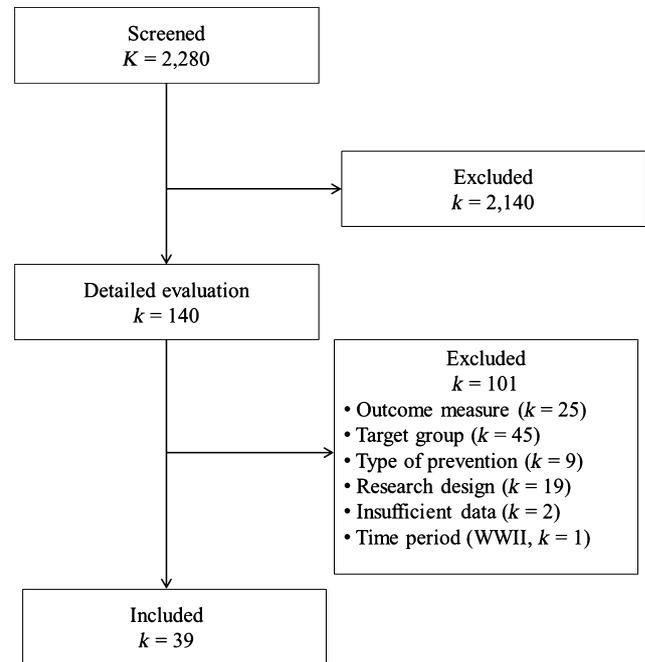
Figure 1 Flowchart of literature search and screening

Literature search procedures

Electronic databases of PsychINFO, ERIC, PubMed, Sociological Abstracts, Criminal Justice Abstracts, Google Scholar were searched through for articles, books, chapters, dissertations, and reports. Until September 2012 studies were collected using keywords regarding research method, program features, study outcomes, and respondents in different combinations: (quasi-)experiment, randomized controlled (clinical) trial, program*, intervention*, prevention*, delinquent*, antisocial behavior, crime*, youth at risk, juvenile*, adolescent*, (first time) offender*, and effect*. Next, manual searches of reference sections of articles, reviews, and book chapters were conducted. Finally, we contacted authors by email to obtain (unpublished material) dissertations, and to receive more information than was provided in the selected articles.

The study selection process is presented in Figure 1. Full texts of 140 articles were assessed for eligibility and 101 studies (articles) were excluded because they did not meet the study selection criteria. The final analyses included 39 independent studies (39 samples and 95 effect sizes) written or published between 1973 and 2009.

Coding of participant, program, and study characteristics

Following the guidelines of Lipsey and Wilson (2001) a coding system was developed. First, with regard to *participant characteristics*, we collected information on mean age at first measurement, gender, ethnicity, SES (based on annual household income, receiving

free or reduced school lunch, mean education of parents), level of delinquency, country and degree of urbanization (urban, sub-urban or rural). Second, we retrieved information on the following *program characteristics*: type of referral organization, type of prevention (selective or indicated), setting (home, school, clinic, court, community, or ambulant), program format (one-on-one treatment, group, family or mixed/multimodal), type of the program, components of the program, primary target population (juveniles only, parents and juveniles, parents, juveniles, and siblings), type of trainer and program drop-out. Regarding time and period of the program, we collected data on total duration in weeks, intensity (number of hours per week and total contact hours), and frequency (number of sessions per week). Finally, we focused on the following *study characteristics*: study design (RCT or quasi-experimental), method of assignment (random or nonrandom), method of matching, equivalence of groups at pretest, type of control condition, sample size, percentage of drop-out, measurement of program integrity, publication year, and journal impact factor. In order to retrieve specific information on measurement of delinquency we collected information on sources of information (official records or self-reports), length of follow-up period in months, type of delinquency (general, property, violent crime, etc.) and dimension of delinquency and recidivism (participation in delinquency, frequency, seriousness and versatility1 in offending). Further details for the coding data instrument are included in the Appendix S1, including a detailed presentation of study descriptors. The classification of *type and components of programs* was based on classifications from the Campbell Collaboration, previous research (Bradshaw et al., 2006; Farrington & Welsh, 2003; Landenberger & Lipsey, 2005; Latimer, 2001; Lösel & Beelmann, 2003; Nugent et al., 2004; Schwalbe et al., 2012) and the program descriptions provided in the studies included in the present meta-analysis. This classification resulted in the following *types of programs*: cognitive skills training, behavioral modification, interpersonal problem solving, social skills training, life skills training, anger management, moral reasoning, mediation, and mentoring. In addition, we made a more detailed classification of the following specific *program components*: academic service, employment related service, behavioral modeling, behavioral contracting, victim impact or material and emotional restitution, conflict resolution, community service, parenting skills, communication skills, recreation activities, counseling, rewarding appropriate behavior, and self-efficacy. The coding process started by coding and discussing five randomly selected studies by the two coders (first and third author). Disagreements were resolved through consulting the studies and discussion until consensus was reached. After this process the coding form was

refined and all variables of 39 studies were scored by the first and third author. To assess inter-rater agreement, 10 studies consisting of 21 analyses were randomly selected and scored by two coders (first and third author). Inter-rater agreement was analyzed by calculating the percentage of agreement for all study characteristics, Kappa for categorical variables and intraclass correlation for continuous variables. The inter-rater reliability for categorical variables proved to be satisfactory, with Kappa's ranging from 0.64 (80% agreement) for program type 'life skills training' to 1.00 (100% agreement) for socio-economic status, program components (modeling, contracting, and parenting skills) and primary target population. The inter-rater reliability for continuous variables was very good, with intraclass correlations ranging from 0.99 (90% agreement) for percentage of cultural minority (Hispanic/African American) to 1.00 (100% agreement) for the effect size value, overall mean age of sample, and percentage of males.

Data analysis

For each study one or more effect sizes were calculated. To examine the difference in delinquency scores between the experimental and control group Cohen's d was calculated. Cohen's d was usually calculated on the basis of mean scores and standard deviations or proportions (based on recidivism rates). The reported statistical tests were transformed into Cohen's d with formulas from Lipsey and Wilson (2001) and Mullen (1989). Pretest scores were taken into account by subtracting these scores from the posttest scores of the effect sizes. Each continuous moderator was centered around its mean and dichotomous dummy codes were made for the categorical variables.

Independence of study results is essential when conducting a meta-analysis to prevent that a particular study is weighted more strongly than other studies (Lipsey & Wilson, 2001; Mullen, 1989; Rosenthal, 1991). Following Hoeve et al. (2012) and Van Stam et al. (2014), to deal with dependency of study results, we used a multilevel random effects model for the calculation of combined effect sizes and for conducting moderator analyses (Hox, 2002; Van den Noortgate & Onghena, 2003). A multilevel random effects model allows for the hierarchical structure of the data, in which the effect sizes (the lowest level) are nested within studies (the highest level). In multilevel research, a random effects model is often used, which can be extended by including moderators (e.g. sample characteristics) as potential explanations of the variability of the outcome of studies (Hox & De Leeuw, 2003). In a multilevel meta-analysis all data and effects sizes can be included, which increases statistical power. For conducting multilevel analysis we used the program MLwiN. For the estimation of unknown parameters

in the model, we applied the restricted iterated generalized least squares method.

File drawer problem

Publication bias forms a common problem when conducting a meta-analysis. Studies with nonsignificant results are less likely to be published than those with strong significant results. This tendency, referred to as the *file drawer problem*, may have implications for the final conclusions of the meta-analysis (Rosenthal, 1991).

To investigate whether studies included in the present meta-analysis form a random sample of all studies conducted on the subject, we applied two conventional methods. First, we calculated the fail-safe number, which is the minimum number of additional studies with non-significant results needed to reduce significant meta-analytic results to nonsignificance. (Durlak & Lipsey, 1991; Rosenthal, 1995). Results of the meta-analysis are considered to be robust if the fail-safe number exceeds the critical value obtained with Rosenthal's (1995) formula of $5*k + 10$. The number of effect sizes is represented by k. Second, we inspected the distribution of each individual study's effect size on the horizontal axis against its sample size, standard error on the vertical axis. If no publication bias is present, the distribution of effect sizes should be shaped as a funnel (Sutton, Duval, Tweedie, Abrams, & Jones, 2000). In the present study, funnel plot asymmetry was tested by regressing the standard normal deviate, defined as the effect size divided by its standard error, against the estimate's precision, which largely depends on sample size (Egger, Smith, Schneider, & Minder, 1997).

Findings

The present meta-analysis included 39 studies, providing data on 9,084 participants ($N = 4,755$ treatment group and $N = 4,329$ control group). Sample sizes ranged from 32 (Augimeri, Farrington, Koegl, & Day, 2007) to 782 participants (McGarrell & Hipple, 2007), with an average of 229 participants per study. The mean age of the participants was 14.18 ($SD = 2.45$, age range: 6–20 years2). An overview of all studies included in the meta-analysis can be found in Table 1.

The overall mean effect size for the effects of prevention programs was $d = 0.24$, $p < .001$ ($k = 95$ effect sizes), which indicated a small overall mean effect, based on the criteria for interpretation of effect sizes formulated by Cohen (1988).3 The overall mean effect size of .24 corresponds to a significant reduction of 13.44% in delinquency compared to care as usual or no treatment (based on the success rate difference, Kraemer & Kupfer, 2006). The fail-safe number, 4,332 ($p < .05$, $k = 95$), exceeded Rosenthal's (1995) critical

value ($5*k + 10 = 485$), which indicated no evidence of publication bias. This outcome was confirmed by testing of funnel plot asymmetry. There was no indication of funnel plot asymmetry, as the intercept did not significantly deviate from zero ($t = 0.864$, $p = .393$).

The overall mean effect size was heterogeneous ($Z = 3.87$, $p < .001$), indicating that the variation across studies might be caused by study, program, or participant characteristics. To detect if differences between effect sizes have another source than subject-level sampling error, we conducted moderator analyses.

Participant and program characteristics

Table 2 presents the results concerning the significant categorical moderators. No significant effects of age, gender, and ethnicity were found (a table with all moderators, including nonsignificant results, is presented as Table S1).

Several program characteristics affected program effectiveness. First, specific program components accounted for a significant proportion of the variation in effect sizes. *Behavioral Modeling* ($d = 0.57$, $Z = 2.1$, $p < .05$), *Parenting Skills* ($d = 0.63$, $Z = 3.2$, $p < .01$), and *Behavioral Contracting* ($d = 0.61$, $Z = 2.2$, $p < .05$) were significantly associated with better program outcomes, indicating that programs containing these specific components yielded larger effect sizes. The effectiveness of prevention programs was not related to program type.

Furthermore, the composition of the target group was significantly associated with effect size. Programs involving mixed target populations (juveniles, parents, and siblings) showed larger effect sizes ($d = 0.72$, $Z = 3.5$, $p < .001$) than programs that targeted only juveniles or juveniles and parents. In addition, the specific setting accounted for significant differences in effect sizes. Programs carried out in court settings ($d = -0.34$, $Z = -2.1$, $p < .05$) yielded smaller effect sizes than programs carried out in the direct environment of juveniles (home, school, community, and ambulant setting). With regard to the format of the program, programs carried out in a family format ($d = 0.65$, $Z = 3.2$, $p < .01$) and multimodal format ($d = 0.36$, $Z = 2.8$, $p < .01$) yielded larger effect sizes than individual ($d = 0.26$) and group-based programs ($d = -0.03$).

Table 3 presents an overview of the continuous moderator variables (with more detailed results available in Table S3). First, the intensity of the program (in hours per week) was significant ($Z = -2.1$, $p < .05$), which indicates that less intensive programs were associated with larger effect sizes. Total contact hours (duration $\times$ intensity) was also significant ($Z = -2.0$, $p < .05$), indicating that a smaller amount of contact hours of programs was associated with larger effect sizes. The moderator effect of number of

Table 1 Studies included in the meta-analysis

Study	Year	Main intervention	Treatment format	*n* EC	*n* CG	Mean age (in years)	Minority %	Study design	Condition of CG
Alexander & Parsons	1973	Short-term behavioral intervention	Family	46	40	Unknown	Unknown	RCT	TAU
Arbuthnot & Gordon	1986	Moral reasoning	Multimodal	24	24	14.5	0	RCT	No treatment
Augimeri et al.	2007	Community-based program	Multimodal	16	16	8.9	Unknown	RCT	TAU
Baffour	2006	Family Group conferencing	Multimodal	80	212	13.6	60	Quasi	TAU
Bergseth & Bouffard	2007	Restorative justice program	Multimodal	164	166	14.7	28	Quasi	No treatment
Berry et al.	2009	Coaching for communities program	One-on-one	32	31	Unknown	Unknown	RCT	TAU
Blechman et al.	2000	Mentoring & skill training	Unknown	55	137	15.3	23	Quasi	TAU
Bottcher & Ezell	2005	Boot camps	Group	344	277	17.5	75	RCT	TAU
Brier	1994	Diversion program	Group	158	34	17.7	95	Quasi	Minimal contact
Bry	1982	School-based program	Group	30	30	15.5	42	RCT	Unknown
Byles & Maurice	1979	Family therapy	Family	154	151	11.6	37	RCT	TAU
Chernoff & Watson	2000	Community-based diversion program	One-on-one	213	300	Unknown	82	Quasi	TAU
Cox	1999	Education program	Multimodal	41	42	13.0	Unknown	RCT	TAU
Davidson et al.	1987	Diversion program	One-on-one	76	89	14.2	26	RCT	TAU
Davidson & Wolfred	1977	Behavior-modification program	Group	42	42	14.2	15	Quasi	Unknown
Fo & O'Donnell	1975	Community-based program	One-on-one	48	25	Unknown	Unknown	RCT	No treatment
Gordon et al.	2007	Behavioral family therapy	Family	27	27	15.4	0	Quasi	TAU
Gottfredson	1986	School-based program	Group	296	249	Unknown	100	RCT	TAU
Hanlon et al.	2002	Community-based program	Multimodal	235	193	13.3	97	Quasi	TAU
Hayes	2005	Restorative justice conferences	One-on-one	64	158	13.7	Unknown	RCT	TAU
Jones & Ross	1997	Boot camps	Group	331	369	20.0	48	Quasi	TAU
Jones et al.	2004	Wilderness Adventure program	Group	24	11	13.6	63	Quasi	Alternative treatment
Keating et al.	2002	Mentoring	One-on-one	34	34	13.1	68	Quasi	Waiting list
Kelley et al.	2003	Probation	Multimodal	143	143	15.2	15	RCT	Placebo
Kirigin et al.	1982	Family Group homes	Group	140	52	14.6	21	Quasi	TAU
Lane et al.	2005	Probation program	Multimodal	226	236	15.0	91	RCT	TAU
Lee & Haynes	1978	Community outreach counseling	Multimodal	29	32	15.2	53	RCT	TAU
Leiber & Mawhorr	1995	Skills training	Group	85	141	15.8	30	Quasi	TAU
McGarrell	2001	Restorative Justice Conferences	Group	167	168	Unknown	61	RCT	TAU
McGarrell & Hipple	2007	Family Group Conferencing	Group	400	382	12.6	60	RCT	TAU
McPherson et al.	1983	Counseling	Multimodal	15	60	15.0	Unknown	RCT	TAU
Nugent & Paddock	1995	Victim-offender mediation	Multimodal	111	130	15.4	12	Quasi	TAU
Patrick et al.	2004	Diversion program	One-on-one	71	68	Unknown	9	RCT	TAU
Poulin et al.	2001	Cognitive behavioral program	Group	57	62	12.4	5	Quasi	Nothing
Quinn & Van Dyke	2004	Multiple family group program	Family	360	95	14.2	55	Quasi	TAU
Stickle et al.	2008	Teen courts	Group	42	33	14.9	35	RCT	TAU
Stuart et al.	1976	Behavioral program	One-on-one	30	30	Unknown	43	Quasi	Placebo
Vitaro & Tremblay	1994	Multicomponent program	Multimodal	38	38	6.1	0	RCT	Minimal contact
Welsh et al.	1999	Community-based program	Unknown	62	83	13.6	99	Quasi	Nothing

n EC, number of participants in experimental group; *n* CG, number of participants in control group; Minority %, percentage of cultural minority; RCT, randomized controlled trial; Quasi, quasi-experimental design; TAU, treatment as usual.

Table 2 Results for the overall mean effect size and categorical moderators (see also Table S1, S2, and S4)

Moderator variables	# Studies	# ES	β (SE)	Mean d	Z	Heterogeneity	Δfit
Overall	39	95		0.24	3.7***	3.9***	–
Program characteristics							
Program components							
Behavioral modeling							
No (RC)	32	81		0.20	2.1*	3.8***	4.3*
Yes	6	13	0.373 (0.180)	0.57***			
Parenting skills							
No (RC)	31	74		0.16	3.2**	3.7***	9.5**
Yes	7	20	0.474 (0.150)	0.63***			
Behavioral contracting							
No (RC)	33	84		0.20	2.2*	3.7***	4.7*
Yes	5	10	0.409 (0.188)	0.61***			
Primary target population							
Juveniles (RC)	31	78		0.15*	–	3.7***	11.7**
Mixed (juveniles and parents)	2	6	0.136 (0.270)	0.28	0.5		
Mixed (juveniles, parents and siblings)	6	11	0.578 (0.165)	0.72***	3.5***		
Program format							
Group (RC)	13	40		−0.03	–	3.6***	13.4**
One-on-one	8	13	0.290 (0.158)	0.26*	1.8		
Family	4	4	0.673 (0.208)	0.65***	3.2**		
Multimodal	12	35	0.385 (0.137)	0.36***	2.8**		
Setting							
Ambulant setting (RC)	4	11		0.50*	–	3.0**	8.0
Home	2	2	0.069 (0.409)	0.57	0.2		
Public school	4	7	−0.187 (0.327)	0.31	−0.6		
Specialized school	1	2	−0.732 (0.508)	−0.24	−1.4		
Clinic	1	5	−0.677 (0.485)	−0.18	−1.4		
Court	2	5	−0.833 (0.388)	−0.34	−2.1*		
Community-based	4	7	−0.288 (0.323)	0.21	−0.9		
Other	5	16	−0.408 (0.306)	0.09	−1.3		
Study characteristics							
Type of matching							
Not applicable (RC)	24	52		0.28***	–	3.8***	12.2
Matched on pre-test measure	1	2	−0.204 (0.376)	0.08	−0.5		
Matched on personal characteristics	3	13	−0.086 (0.230)	0.19	−0.4		
Matched on demographics	1	1	1.375 (0.477)	1.65***	2.9**		
Matched on two of the above	6	15	−0.194 (0.173)	0.08	−1.1		
Matched on three of the above	1	5	−0.459 (0.359)	−0.18	−1.3		
Equated groupwise	2	3	−0.194 (0.273)	0.08	−0.7		
Delinquency type measured							
General (RC)	39	82		0.23***	–	3.9***	26.9***
Violence	2	4	0.197 (0.056)	0.43***	3.5***		
Property crime	3	6	0.040 (0.054)	0.27**	0.7		
Vandalism	1	1	0.134 (0.260)	0.37	0.5		
Drug-related crime	1	1	−0.162 (0.093)	0.07	−1.7		
Other crime	1	1	−0.180 (0.093)	0.05	−1.9		
Delinquency dimension measured							
Participation (RC)	34	64		0.28***	–	3.9***	22.9***
Frequency	10	18	−0.058 (0.058)	0.23**	−1.0		
Seriousness	6	12	−0.399 (0.110)	−0.12	−3.6***		
Versatility (number of crime types)	1	1	−0.429 (0.138)	−0.15	−3.1**		

RC, reference category; # Studies, number of independent studies; # ES, number of effect sizes; Z, moderator significance; mean d, mean effect size; Heterogeneity, within class heterogeneity (Z); Δfit, difference with model without moderators (χ^2).
*p < .05; **p < .01; ***p < .001.

sessions was significant (Z = −2.3, p < .05), which implies that fewer sessions were related to larger effect sizes.

Study characteristics

Concerning study moderators, type of matching accounted for a significant proportion of the variation in effect size (see Table 2). We found that one study, applying the method of matching on demo-graphics, yielded a larger effect size (d = 1.65, Z = 2.9, p < .01) than studies using other matching methods. The type of delinquency was also significantly associated with the variation in effect sizes. Studies that measured 'violence' showed larger effect sizes compared to studies that measured general delinquency (d = 0.43, Z = 3.5, p < .001 vs. d = 0.23, general delinquency). Concerning dimension of delinquency, we found significant effects of seriousness (d = −0.12, Z = −3.6, p < .001) and

Table 3 Results for the continuous moderators (see also Table S3).

Moderator variables	# ES	β_0 (SE)	β_1 (SE)	Z	Heterogeneity	Δfit
Program descriptors						
Duration in weeks	64	0.234 (0.091)	0.00091 (0.00236)	0.4	3.0**	0.1
Intensity	27	0.168 (0.128)	−0.01609 (0.00766)	−2.1*	2.1*	4.3*
Total contact hours	31	0.155 (0.111)	−0.00086 (0.00043)	−2.0*	2.2*	4.0*
Number of sessions	28	0.033 (0.090)	−0.09515 (0.04139)	−2.3*	2.1*	5.1*

ES, number of effect sizes; Z, significance of moderator; heterogeneity, within class heterogeneity (Z); Δfit, difference with model without moderators (χ^2).
*$p < .05$; **$p < .01$.

versatility ($d = -0.15$, $Z = -3.1$, $p < .01$), indicating that studies measuring these specific dimensions showed smaller effect sizes than studies that measured participation ($d = 0.28$) and/or frequency ($d = 0.23$) of delinquent acts. (For significant and non-significant results of the bivariate analyses, see the table in Appendix S2).

Unique contribution of program characteristics

Several multivariate analyses were conducted to examine the unique contribution of program characteristics to the variance in effect sizes. Because of missing data, we were not able to test all significant moderators simultaneously. First, we tested the combined contribution of significant program characteristics to effect size: setting, format, components, and target group of the program. We found a significant effect of components (parenting skills, $Z = 2.7$, $p < .01$) and format (one-on-one, $Z = 2.3$, $p < .05$). Next, we examined the unique contribution of the other significant moderators (method of matching, intensity of the program, type and dimension of delinquency) over and above components and program format. We found a significant effect of the treatment frequency (number of program sessions, $Z = -2.4$, $p < .05$), type of delinquency (violence, $Z = 3.6$, $p < .001$), and dimension of delinquency (seriousness, $Z = -3.8$, $p < .001$ and versatility, $Z = -3.3$, $p < .001$), adjusting for components and program format (Results of multivariate analyses are available on request).

Discussion

The main purpose of this meta-analysis was to examine the contribution of participant, program, and study characteristics to the effectiveness of prevention programs for persistent juvenile delinquency. We found that these programs in general are effective in preventing persistent juvenile criminal behavior. The overall mean effect size ($d = 0.24$) was significant, but small in magnitude, which corresponds approximately to a 13% reduction in delinquent behavior compared to care as usual or no treatment (Kraemer & Kupfer, 2006). These results suggest that the prevalence of offending could be reduced by about 13% by implementing such programs, irrespective of the base rate of (re)offending, which was estimated to be 50% in a recent meta-analysis by Koehler, Losel, Akoensi, and Humphreys (2013). A 13% reduction in offending against a baseline of 50% would imply an offending rate of 37% in juveniles attending effective prevention programs for persistent juvenile delinquency. However, behavioral-oriented programs, focusing on learning positive behavior through role models, preparing behavior contracts, improving parenting skills, or family based programs yielded a medium and significant reduction in offending of approximately 30% compared to treatment as usual or no treatment, which amounts to a favorable offending rate of only 20%.

Effect sizes of the present study were somewhat larger than those found in meta-analyses of curative programs (Lipsey, 2009) and aftercare programs following detention of juvenile offenders (James et al., 2013). These studies included programs that were aimed at more severe juvenile offenders, whereas our study was focused on prevention programs targeting juveniles at the onset of their criminal career. Apparently, prevention seems more effective than cure.

Participant characteristics

Our findings suggest that prevention programs are equally effective for boys and girls, younger and older juveniles, and juveniles from different cultural backgrounds. The finding that boys and girls equally benefit from preventive programs is in line with an earlier review of gender differences in effectiveness of curative interventions for juvenile delinquents (Zahn, Day, Mihalic, & Tichavsky, 2009). Given that we did not find an effect of age on study outcomes, it can be concluded that preventive programs are effective for juveniles with an onset of delinquent behavior from childhood to late adolescence. Although it has been suggested that 'adolescent-onset' juveniles desist from antisocial behavior during early adulthood (e.g. Moffitt, 1993), they have also been documented to continue engaging in criminal behavior beyond adolescence (Fairchild, Van Goozen, Calder, & Goodyer, 2013; Odgers et al.,

2007; Wiesner, Kim, & Capaldi, 2005). Finally, our study showed that different ethnic groups respond relatively similar to prevention programs. This is consistent with a meta-analysis of Wilson et al. (2003), confirming that mainstream programs for juvenile delinquents were equally effective for minority and white youth.

Program characteristics

Examining core elements of programs, we found that programs containing behavioral modeling, contracting, or parenting skills yielded larger reductions in delinquency. Studies that focused on these program elements revealed medium effects. These three program components are mainly based on the cognitive social learning theory (SLT) of Bandura (Bandura & Walters, 1963), and are characterized by a behavioral orientation. The positive impact of these components is consistent with findings of Lösel and Beelmann (2003), Lipsey (2009, 2012) and Andrews, Bonta, and Hoge (1990), indicating that skill building approaches containing a behavioral orientation are most effective. Moreover, earlier studies indicated that multifacetted programs, including multiple components for parents, youths, and their environment (school and community) appear to be more beneficial than narrowly focused programs (McCord, Widom, & Crowell, 2001).

Our study showed relatively large effects for programs with a family and multimodal format (individual, family-, and group-based), adjusting for the effects of program components and various other moderators. Although involving the family system seems effective in both preventive and curative interventions (Litschge, Vaughn, & McCrea, 2010), James et al. (2013) showed that individual after care programs for severe juvenile offenders were more successful than those focusing on the social (family) system. In accordance with James et al. (2013) and earlier studies (Ang & Hughes, 2001; Arnold & Hughes, 1999; Dishion & Dodge, 2006; Dishion, McCord, & Poulin, 1999), we found that individual, family based, and multimodal programs showed larger effects than group-based programs, which proved to be ineffective ($d = -0.03$). Group-based programs may include antisocial peers who are negative role models reinforcing one another's delinquent behavior. The ineffectiveness of peer-group programs is confirmed by longitudinal research revealing that 'deviancy training' within adolescent friendships predicts increases in delinquency (Dishion et al., 1999).

The intensity of the program was related to program effectiveness. The effectiveness of programs reduced when the number of program sessions was relatively high, indicating that highly intensive programs could be counterproductive for less serious offenders, even when adjusting for the influence of other moderators. The finding that less intensive treatment can be effective is consistent with previous research. For example, a meta-analysis on wilderness challenge programs for delinquent youths showed that extended programs (duration over 10 weeks) were related to smaller effects (Wilson & Lipsey, 2000). According to the risk principle of effective judicial interventions, the intensity of an intervention must be adjusted to the juvenile's risk for recidivism (Andrews & Dowden, 2007; Andrews et al., 1990). This dose-response principle is confirmed in meta-analyses by, among others, Lipsey (2009) and Koehler et al. (2013). For example, diversion programs providing the minimum amount of services proved to be most effective for low-risk youth (Wilson & Hoge, 2012). Notably, the less is more principle has also precedents elsewhere in child psychopathology, for example, in the domain of (preventive) attachment-based intervention (Bakermans-Kranenburg, Van Ijzendoorn, & Juffer, 2003).

Study characteristics

No differences in magnitude of the effect sizes were found between RCT and quasi-experimental designs. This finding contradicts results from previous reviews indicating that experimental research designs are associated with smaller effects (Latimer, 2001; Lipsey, 2003; Weisburd, Lum, & Petrosino, 2001). However, most included quasi-experimental studies matched groups on different variables prior to assignment of the condition, tested equivalence of groups at pre-test and significant differences between groups were taken into account in the analysis. Moreover, there was no significant difference in sample sizes and drop-out rates between quasi-experimental and experimental studies.

Concerning measurement of delinquency and recidivism, studies that measured participation in and frequency of criminal and violent acts (instead of general delinquency) showed larger effect sizes than studies measuring seriousness and versatility. This suggests that reductions in delinquency not necessarily coincide with reductions in seriousness of criminal acts.

The relatively larger effects for interventions targeting violent behavior may also be explained by the distinction between overt and -covert antisocial behavior (Loeber & Schmaling, 1985). It is possible that overt antisocial behavior, such as physical aggression, can be treated more effectively than covert antisocial behavior, such as theft and vandalism, because it is more visible (Van der Helm, 2011).

Study limitations

Several limitations of this meta-analysis must be kept in mind. First, an important limitation is that the reported information of the studies included in

the meta-analysis was limited. A relatively large amount of studies failed to report important information on program characteristics, such as precise duration and intensity of the program as well as format and setting of the program. Also, it was not possible to examine the specific role of program integrity, as most studies did not report whether the program was adequately implemented (only six of 39 studies measured program integrity). Program integrity is an important factor influencing program outcomes (Lipsey, 2009). However, the assessment of program integrity in outcome studies of interventions targeting conduct problems is rare. Likewise, only a few studies use valid and reliable instruments to measure program integrity (see Goense, Boendermaker, van Yperen, Stams, & van Laar, 2014). Another limitation is that data of several program descriptors were based on a limited number of studies and effects sizes.

Second, rates of psychopathology are high among juvenile delinquents (e.g. Wasserman, McReynolds, Schwalbe, Keating, & Jones, 2010). Furthermore, psychopathology has been found to be associated with offending (Copeland, Miller-Johnson, Keeler, Angold, & Costello, 2007) and recidivism (Hoeve, McReynolds, McMillan, & Wasserman, 2013). For example, youths in detention (pre-trial) and secure post adjudication facilities report high rates of mental health disorders: 60%–65% have one or another disorder (Wasserman et al., 2010). Even of those who enter the juvenile justice at system probation or family court intake (pre-trial), 35% have a psychiatric disorder, compared to about 15% in the community. Despite these findings, most studies in this meta-analysis did not report prevalence of mental disorders, and we were therefore not able to test potential moderating effects of psychopathology. In present meta-analysis only three studies reported specific rates of mental disorders in their samples. Brier (1994) reported that 87% of the experimental group met diagnostic criteria for a learning disability. All participants in the study of Keating, Tomishima, Foster, and Alessandri (2002) were rated in the clinical range of externalizing and internalizing behavior (based on the CBCL parent and teacher ratings). Finally, Vitaro and Tremblay (1994) reported that 73% of the sample scored above 70th percentile on aggressive behavior (measured by the Preschool Behavior Questionnaire).

Although we searched for published and unpublished studies, the present meta-analysis was exclusively based on published studies because unpublished studies did not meet our selection criteria. Although excluding unpublished studies might increase the risk for publication bias, analyses showed that publication bias was unlikely. Finally, it should be kept in mind that the present study was mainly based on Western countries, particularly the United States. Since countries differ in social and political climate, organization of mental health services, ethnic background of clients, etc., it is questionable whether the present results are also representative for nonwestern countries (Deković et al., 2011).

Implications for policy and clinical practice

The present study provided support for the notion that prevention of persistent juvenile delinquency is recommended. Our study shows that prevention programs can be effective in preventing youths from developing a persistent course of criminal behavior and as a result, these programs may prevent a substantial amount of individuals from becoming a future victim of crime. Additionally, the present study provides some important implications for clinical practice.

When implementing best practices, clinical professionals and policy makers should opt for programs that produce the largest effects on preventing delinquency. Regarding the specific approach of crime prevention, it is advised to implement behavioral-oriented programs. Programs should integrate elements of *behavioral contracting, modeling,* and *parenting skills training*, given that we found the strongest effects of programs with these components. These components are theoretically grounded in the cognitive SLT of Bandura (Bandura & Walters, 1963). SLT provides clear principles and techniques for practitioners. According to SLT, new patterns of behavior are learned through direct experience or by observing behavior of others. *Modeling* can be perceived as a core technique of SLT: juveniles learn appropriate behavior through observing competent models who demonstrate how the required activities should be performed. In turn, positive behavior is reinforced by *behavior contracts* consisting of valued rewards, which enhance the learning process (Bandura, 1971). The SLT principles offer explicit tools for directly changing inadequate parenting behavior (Scott & Dadds, 2009). Parenting behavioral skill techniques, such as contingency management, are applied in the evidence-based intervention of parent management training targeting juveniles with disruptive behavior problems (Michelson, Davenport, Dretzke, Barlow, & Day, 2013).

Given that we found no effects of group-based programs, one should opt for prevention programs that are delivered in a family context or multimodal format. Family interventions focus on altering the interactions among family members and improving the functioning of the family as a unit. Multimodal programs focus on a variety of criminogenic needs instead of a single risk factor. To address multiple risk factors, these programs include multiple treatment modalities or distinct intervention elements, such as cognitive behavioral therapy and parenting skills training (Wilson & Lipsey, 2007). Multimodal pro-

grams that target multiple needs of delinquent juveniles have been proven effective (Lipsey, 1992, 1995; Lipsey & Wilson, 1998). Finally, the number of sessions in prevention programs for juveniles with low delinquency levels should be kept low (the number of sessions per week in the studied programs ranged from less than one to seven times a week).

Supporting information

Additional Supporting Information may be found in the online version of this article:

Appendix S1. Meta-analysis of prevention programs for juveniles at risk for delinquency data coding instrument.

Appendix S2. Significant and non-significant results for the overall mean effect size and categorical and continuous moderators (bivariate analyses).

Table S1. Overall mean effect size, general information, and sample descriptors.

Table S2. Treatment descriptors.

Table S3. Results for the continuous moderators: sample, treatment, and study descriptors.

Table S4. Study descriptors.

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Key points

Key practitioner message

- Prevention programs are effective in preventing persistent delinquency for juveniles at the onset of a criminal career.
- Evidence-based programs targeting the family system and multimodal programs should be implemented instead of narrowly focused or group-based programs. Group sessions including homogeneous groups of antisocial peers should be avoided.
- Programs should incorporate specific components of training parenting skills, learning positive behavior through role models, and behavior contracts.
- The intensity of the program should be matched to risk for delinquency.

Areas for future research

- Given that levels of psychopathology are high among juvenile delinquents, it will be valuable to test potential moderating effects of psychopathology.
- Program integrity has been widely acknowledged as a crucial factor contributing to the effectiveness of interventions. Therefore, it is important to include valid and reliable measures of program integrity in program evaluations of preventive interventions.
- To obtain more extensive information on distinct effects of program types and components, future evaluation studies should operationalize the specific program types, approaches, techniques, and components so that the relative effectiveness of program components can be studied more effectively.
- The relation between program intensity and effectiveness warrants further investigation for the broad range of juveniles at risk for offending.

Notes

1. Number of different crime types measured.
2. The study is focused on juveniles from 8 to 20 years at the start of the intervention. The time of first measurement in one of the studies was before the start of the intervention (M age at first measurement was 6 years).
3. Effect sizes are categorized as small ($d = 0.20$), medium ($d = 0.50$), and large ($d = 0.80$) group differences, whereas the effect sizes of $d = 0.00$ would indicate that there was no difference between experimental and control groups.

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