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Parent- and self-reported dimensions of oppositionality in youth: Construct validity, concurrent validity, and the prediction of criminal outcomes in adulthood

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All authors declare that they have no conflicting interests to report with the design and the findings of the present study.

Abstract

Background: Different dimensions of Oppositional Defiant Disorder (ODD) have been found as valid predictors of further mental health problems and antisocial behaviors in youth. The present study aimed at testing the construct, concurrent, and predictive validity of ODD dimensions derived from parent- and self-report measures. ***Method:*** Confirmatory factor analyses were performed to test a three-dimensional model (ODD-irritability, ODD-headstrong and ODD-hurtful) and a two-dimensional model (ODD-irritability, ODD-headstrong/hurtful) based on items of the Child Behavior Checklist (CBCL) and the Youth Self-Report (YSR) collected in a Swiss community study of 1031 adolescents (519 boys, 512 girls) aged between 10.7 and 17.9 (Mean=13.85, SD=1.63) years. Logistic regression analyses were applied to predict scores in the clinical range of concurrent CBCL/YSR-anxiety/depression, CBCL/YSR-attention problems, CBCL/YSR-delinquent behavior and depression as measured by the Center for Epidemiological Studies Depression Scale (CES-D) as well as to predict the presence of adult criminal convictions. ***Results:*** CFA findings were in favor of a three-dimensional model rather than a two- dimensional model of ODD. The CBCL/YSR-ODD-irritability scale was related to concurrent self-reported depression but also to attention problems and delinquent behavior. CBCL/YSR-ODD-hurtful and less strongly also the combined YSR-headstrong/hurtful scale predicted adult criminal outcomes. **Conclusions:** As proposed by the DSM-5 workgroup, different ODD-dimensions were confirmed by the present study. ODD-irritability predicts psychiatric comorbidity and ODD-hurtful symptoms should be specifically considered in youth at risk for criminal outcomes.

Keywords

Oppositionality, oppositional defiant disorder, CBCL, YSR, child and adolescent psychopathology.

Introduction

Recent studies have put the current concept of oppositional defiant disorder (ODD) into question and suggested that ODD is not only a precursor of conduct disorder (CD) but, rather, an independent disorder which may persist into adolescence (Maughan, Rowe, Messer, Goodman, & Meltzer, 2004) and has other outcomes and co-morbidities than CD (Copeland, Shanahan, Costello, & Angold, 2009; Greene et al., 2002; Nock, Kazdin, Hiripi, & Kessler, 2007; Rowe, Costello, Angold, Copeland, & Maughan, 2010). Beyond the well known association of ODD with attention-deficit-hyperactivity-disorder (ADHD) and CD (Moffitt et al., 2008), a number of studies found a strong link between ODD and internalizing disorders (Boylan, Vaillancourt, Boyle, & Szatmari, 2007; Burke & Loeber, 2010), particularly between concurrent and later childhood, adolescent, and adult depression (Boylan, Georgiades, & Szatmari, 2010; Burke, Loeber, Lahey, & Rathouz, 2005; Copeland, et al., 2009; Rowe, et al., 2010). Furthermore, ODD was found to contribute to later adult antisocial behaviors independent of CD (Langbehn, Cadoret, Yates, Troughton, & Stewart, 1998) and ODD independent of CD was the strongest predictor of criminal recidivism in incarcerated male juveniles (Plattner et al., 2009).

Given the heterogeneous outcomes of ODD, different dimensions based on DSM-IV criteria have been suggested (e.g. Burke, Hipwell, & Loeber, 2010; Ezpeleta, Granero, de la Osa, Penelo, & Domenech, 2012; Stringaris & Goodman, 2009b; Wakschlag et al., 2012). Stringaris and Goodman (2009a, 2009b) proposed a three-dimensional concept of ODD including irritability, headstrong, and hurtful. Construct validity of these three ODD-dimensions was confirmed in children with ADHD (Aebi et al., 2010) and evidence was found for the concurrent and predictive validity of all three dimensions: ODD-irritability was related to depression, anxiety and CD (Kolko & Pardini, 2010; Rowe, et al., 2010; Stringaris & Goodman, 2009a, 2009b), and ODD-headstrong was associated with ADHD and CD (Rowe, et al., 2010; Stringaris & Goodman, 2009a, 2009b). Furthermore, ODD-hurtful predicted

severe aggression, treatment-resistance, self reported violence, theft, and vandalism (Kolko & Pardini, 2010; Stringaris & Goodman, 2009a).

In contrast, several other studies found evidence for a two factor model of ODD including an irritability and a headstrong/hurtful ODD-dimension (Burke, et al., 2010; Rowe, et al., 2010; Stringaris, Zavos, Leibenluft, Maughan, & Eley, 2012). Probably because ODD-hurtful is based on the "spiteful and vindictive" DSM-IV criteria only, the findings on hurtful behavior as a separate dimension have remained inconsistent or have not been considered in previous analyses. A recent study found evidence for the inclusion of the DSM-IV criterion "deliberately annoys other persons" into the hurtful dimension instead of the headstrong dimension (Aebi, et al., 2010).

The recently proposed revised concept of ODD by the DSM-5 workgroup on disruptive behavior disorders (American Psychiatric Association, 2011) takes into account the three ODD-dimensions that have been suggested by Stringaris and Goodman (2009a, 2009b) and removed the exclusionary criterion of CD. By confirming and expanding previous findings, the present study aimed at extracting and validating the ODD dimensions from the most widely used clinical parent- and adolescent rating scales, the Child Behavior Checklist (Achenbach, 1991a) and the Youth Self-Report (Achenbach, 1991b).

In agreement with previous research on ODD-dimensions (Achenbach, Dumenci, & Rescorla, 2003; Stringaris, et al., 2012), CBCL and YSR items were assigned to the irritability, headstrong, and hurtful dimensions. In addition, a two dimensional approach of ODD was considered by combining the items from the headstrong and hurtful dimension (Stringaris, et al., 2012). The construct validity of the two-dimensional and the three-dimensional ODD model was tested by use of confirmatory factor analyses (CFA). Concurrent validity was assessed by predicting scores in the clinical range of CBCL/YSR anxious/depressed, attention problems and delinquent behavior scales as well as of depression in the clinical range of the Center for Epidemiological Studies Depression Scale

(CES-D). Finally, as a test of the predictive validity, the power of the ODD-dimension scales in predicting adult crimes some 15 years later was analyzed. Based on previous findings, it was assumed that ODD-irritability would be related to concurrent anxiety and depression, ODD-headstrong and ODD-headstrong/hurtful to concurrent attention problems, and all three ODD-dimensions to concurrent delinquent behavior. Furthermore, we assumed that ODD-hurtful and ODD-headstrong/hurtful would predict the presence and the number of later adult criminal convictions.

Methods

Participants

The data for the present analyses was taken from the Zurich Epidemiological Study of Child and Adolescent Psychopathology (ZESCAP; Steinhausen, Metzke, Meier, & Kannenberg, 1998). In this study, 158 schools and 2780 parents were contacted by letter and asked for their informed consent. The study was approved by the local school administration authorities of the Canton of Zurich. There was no ethical committee existing at the time when the study was performed. A total of 2192 parents (78.8%) gave their informed consent and were willing to participate in the study. 2076 (74.7%) did send back the study questionnaires. Due to adjusting for the various school strata by randomized exclusions, the original community based sample consists of 1964 students aged between 6 and 17 years in 1994. The sample was representative of the residents in the Canton Zurich in terms of sex, the twelve regional counties and the proportion of child and adolescents living in rural vs. urban areas. A full description of the sampling procedures and characteristics has been given in a previous publication (Steinhausen, et al., 1998).

Out of the original sample, children and adolescents from the fifth to ninth grades were asked to additionally fill out self-report questionnaires. In consequence, 1137 participants responded to the YSR and other instruments. After eliminating cases with more than 10% missing values in self report instruments, a sample of 1031 children and adolescent

remained. Hence, the final sample (N = 1031) consisted of 519 (50.3%) boys and 512 (49.7%) girls aged between 10.74 and 17.95 (Mean=13.85 years, SD=1.63) years at the initial assessment. Attrition analyses found no difference between the 106 participants who had been excluded and the remaining 1031 participants regarding sex (male sex 57.5% vs. 50.3%, χ^2=2.00, *df*=1, *p*>.05). However, drop-outs were significantly younger (13.41 vs. 13.85 years, *t*=-2.67, *df*=1135, *p*<.001) and more often of foreign nationality (21.7% vs. 11.8%, χ^2=8.41, *df*=1, *p*>.01).

Measures

Child Behavior Checklist (CBCL) and Youth Self Report (YSR). The Child Behavior Checklist (Achenbach, 1991a) and the Youth Self Report (Achenbach, 1991b) are common measures of parent- and self-reported behavioral and emotional problems in children and adolescents during the past six months. Each instrument consists of 118 items that can be scored on a three point rating scale (0=not true, 1=somewhat true, and 2=very true) and lead to a total problem scale, two second order scales (internalizing and externalizing) and eight empirically derived first order syndrome scales (including the anxious/depressed, attention problems, aggression, and delinquent behaviors scales). A T-score of 70 is considered as cut-off of the clinical range of the empirical syndrome scales. Reliability and validity have been shown to be good for the original CBCL and YSR versions in the US (Achenbach, 1991a, 1991b) as well as for the corresponding Swiss CBCL and YSR versions (Steinhausen, Winkler Metzke, & Kannenberg, 1996, 1999).

ODD-Irritability, ODD-headstrong and ODD-hurtful scales were derived from the CBCL and the YSR (see Appendix 1) by taking into account the recently proposed DSM-oriented ODD scale of the CBCL/YSR (Achenbach, et al., 2003) and previous findings based on YSR items (Stringaris, et al., 2012). In addition to the five items of the DSM-oriented ODD-scale (Achenbach, et al., 2003), three additional items were considered: Because of the strong association between irritability and emotional lability (Aebi, et al., 2010; Stringaris & Goodman, 2009b) the item “sudden changes in mood and feelings” was added to the ODD-

irritability scales. Finally, as both spiteful and vindictive behaviors were not directly assessed by the CBCL or the YSR, the items “cruelty, bulling or mean to others” and “teases others a lot” were assigned to the ODD-hurtful scales. Both items show some face validity for spiteful behaviors. All these eight items of the ODD-dimension scales belong to the empirically based aggression syndrome scale of the CBCL and the YSR (Achenbach, 1991a, 1991b). Both a three-dimensional approach (ODD-irritability, ODD-headstrong, and ODD-hurtful) and a two-dimensional approach (ODD-irritability and ODD-headstrong/hurtful) were compared to a conventional one factor solution of ODD for CBCL and YSR separately. Due to its ambiguous associations to both the headstrong and irritability dimension, the item “stubborn, sullen or irritability” was assigned to both the CBCL- and YSR-ODD-irritability and the ODD-headstrong dimension. However, because of its higher factor loading on the ODD-irritability dimension in CFA and in agreement with a previous study (Stringaris, et al., 2012), in subsequent analyses this item was considered only for the ODD-irritability scale. Information on means and SD of the CBCL/YSR scales is provided in Appendix 2.

Center of Epidemiologic Studies-Depression Scale (CES-D). This scale is a self rating measure of depressive symptoms occurring during the last week (Radloff, 1977) and consists of 20 items with a four point rating scale ranging from zero (*rarely, less than 1 day*) to three (*most time, 5-7 days*). A raw score of 23 was suggested as cut-off for clinical depression (Hautzinger & Bailer, 1993). Considering the age- specific manifestation of depressive symptoms, the CES-D was included only in youth attending the 7^{th} to 9^{th} grades (n=639, aged 12 to 18 years). Because 22 (3.4%) participants did not complete the CES-D or had more than two missing items, only 617 participants were included in the analyses. There is no item in the CES-D that directly addresses irritability.

Official reports of adult crime. In September 2009, criminal records were requested from the Swiss Federal Office of Justice and the study was approved by this administration. Official records were reviewed for each of the study subjects in November 2009.

Subsequently, the data was anonymized in order to secure data confidentiality. At follow-up, participants were between 26.5 and 33.8 (Mean=29.6, SD=1.63) years old. The mean follow-up period was 15.78 (SD=.07) years. Because juvenile offences are not registered in Switzerland, only the number and the penal codes of the adult crime convictions (above 18 years) were included in the present study. Furthermore, due to official regulations, the records of convictions with punishments of less than one year imprisonment were no more available after 10 years. Thus, these convictions for minor crimes were not considered in the analyses. A total of 99 (9.6%) of the 1031 participants were registered for at least one criminal offense in young adulthood (49 were convicted of 2 or more offenses). Additional analyses were performed for violent crimes (*n*=12; including robbery, committed or attempted homicides, manslaughters and other assaults) and serious driving offenses (*n*=38).

Analytic procedure

The eight CBCL- and the eight YSR-ODD items were subjected to confirmatory factor analyses (CFA). Because the criteria of multivariate normality was not fulfilled by the CBCL and YSR items, weighted least square instead of the maximum likelihood estimation was applied using AMOS 18 (Arbuckle, 2007). Three different recommended goodness of fit indicators (GFI) (Hair, Black, Babin, Anderson, & Tatham, 2006) were assessed based on the AMOS 18 software: the root mean square residual (*RMR*) as indicator of the unexplained co-variances of the model, the root mean square error of approximation (*RMSEA*) which includes a parsimony correction, and the comparative fit index (*CFI*) for evaluating the hypothesized model compared to a null model. Acceptance of any model was based on the following cut-offs: *RMR*<.05, *RMSEA*<.08 and *CFI*>.95 (Hu & Bentler, 1999; Marsh, Kit-Tai, & Zhonglin, 2004). A three factor model with the ODD-irritability, ODD-headstrong, ODD-hurtful dimensions as separate but correlated factors, a two factor model with ODD-irritability and ODD headstrong/hurtful dimensions, and a conventional one-factor model based on all eight ODD items were compared separately for the CBCL and the YSR. The χ^2-difference for nested models was used to compare the three-factor model to the two factor model as well

as to the one-factor model of ODD. As described above, the item “stubborn, sullen or irritability” was allowed to load on both the ODD-irritability and the ODD-headstrong dimension simultaneously. Because of the similar concept of “disobedience” included in the CBCL and the YSR items “Disobedient at home” and “Disobedient at school”, the error terms of these two items were allowed to be correlated.

After analyzing the construct validity with CFA, logistic regression (LR) analyses were performed either with the CBCL- and YSR-ODD-irritability, -headstrong, and -hurtful scales (based on the three dimension model) or with the CBCL- YSR-ODD irritability and ODD-headstrong/hurtful scales (based on the two dimension model) serving as predictors. The scores in the clinical range of the corresponding CBCL/YSR anxious/depressed, attention problems, delinquent behavior scales and of depression as measured by the CES-D served as the dependent variables. These analyses were based on dichotomized scores of the CBCL/YSR and CES-D scales according to the recommended cut-off scores demarcating the clinical range. In addition, LR analyses were performed to predict the presence and number of later adult convictions as well as the convictions for violent crimes and serious driving offenses.

Results

CFA of ODD dimensions in CBCL and YSR

The GFI’s resulting from CFA based on CBCL items showed that the three-factor model of ODD (χ^2=19.84, *df*=15, *p*=.18; *RMR*=.006; *CFI*=.99; *RMSEA*=.018) as well as the two-factor model (χ^2=24.56, *df*=17, *p*=.10; *RMR*=.008; *CFI*=.98; *RMSEA*=.021) had an excellent fit to the data. Although the fit indices were slightly better for the former, the three-factor model was not significantly improved compared to the two-factor model (χ^2-difference for nested models = Diff χ^2=4.74, *df*=2, *p*=.010). The one-factor model of ODD (χ^2=53.42, *df*=19, *p*<.001; *RMR*=.011; *CFI*=.90; *RMSEA*=.042) showed a significantly decreased fit compared to both the three-factor solution (χ^2-difference for nested models = Diff χ^2=33.6, *df*=4,

p<.001) and the 2-factor solution (χ^2-difference for nested models = Diff χ^2=28.84, *df*=2, *p*<.001).

Slightly different results were found for the YSR: The three-factor model was fitting the data adequately (χ^2=34.75, *df*=15, *p*<.01; *RMR*=.009; *CFI*=.95; *RMSEA*=.036). However, the two-factor model (χ^2=82.46, *df*=17, *p*<.001; *RMR*=.016; *CFI*=.84; *RMSEA*=.061) was fitting the data less well compared to the three-factor model (χ^2-difference for nested models = Diff χ^2=47.71, *df*=2, *p*<.001). In addition, also the one-factor solution showed less adequate GFI's (χ^2=105.19, *df*=19, *p*<.001; *RMR*=.021; *CFI*=.79; *RMSEA*=.066). The fit of the one-factor solution was significantly lower compared to the three factor model (χ^2-difference for nested models = Diff χ^2=70.44, *df*=4, *p*<.001) as well as compared to the two-factor model (χ^2-difference for nested models = Diff χ^2=22.73, *df*=2, *p*<.001).

The results for the CBCL and YSR three-factor and two-factor ODD solutions are presented in Figure 1 and Figure 2. Internal consistency coefficients as measured by Cronbach`s Alpha for the ODD-irritability, ODD-headstrong (without item "stubborn, sullen and irritability"), ODD-hurtful and ODD-headstrong/hurtful scales were .70, .62, .39 and, .64 for the CBCL-scales and .61, .57, .45 and, .63 for the YSR - scales. All scales based on the three-dimensional model and the two-dimensional model were considered in subsequent analyses.

The correlation matrix of the ODD-irritability, -headstrong, -hurtful and -headstrong/hurtful dimensions derived from the CBCL and YSR is shown in Table 1. Overall, there were moderate to high correlations for the CBCL-ODD-dimensions and moderate but still significant correlations for the YSR-ODD-dimensions. In addition, correlation coefficients between the corresponding ODD-dimension of the CBCL and the YSR were moderate.

Association of ODD-dimensions with concurrent problem syndromes

The results of the LR predicting scores in the clinical range of the CBCL/YSR anxious/depressed, attention problems, and delinquent behavior scales are shown in Table

2. None of the predictors showed multi-collinearity (variance inflation factor [VIF] > 10; Myers, 1990).

Independently of the three- or the two-dimensional approach, CBCL/YSR-ODD-irritability positively predicted scores in the clinical range of CBCL/YSR-anxious depressed, CBCL/YSR-attention problems, CBCL/YSR-delinquent behavior and CES-D depression. All self-reported ODD-irritability scores were consistently related more strongly to all concurrent mental health problems than parent reported ODD-irritability scores. Based on the three-dimensional approach, CBCL-ODD-headstrong but not YSR-ODD-headstrong also predicted concurrent attention problems. The CBCL-ODD-headstrong score as well as the CBCL-ODD-hurtful score was positively related to concurrent delinquent behaviors: This was not true for the corresponding YSR-ODD-dimensions. The YSR-ODD-hurtful-dimension showed only one specific association with concurrent syndromes, namely, a negative association with CES-D depression. Based on the two-dimensional approach, CBCL-ODD-headstrong/hurtful but not YSR-ODD-headstrong/hurtful was positively related to attention problems and both CBCL-ODD-headstrong/hurtful and YSR-ODD-headstrong/hurtful were positively related to delinquent behavior.

Prediction of adult crimes

The results of the LR predicting the presence of convictions for any crime as well as violent crimes and serious driving offenses by the CBCL- or YSR-ODD-dimension scales are shown in Table 3. Based on the three-dimensional approach of ODD, the presence of any criminal conviction and any serious driving offense was predicted only by CBCL/YSR-ODD-hurtful but not by the CBCL/YSR-ODD-irritability or ODD-headstrong scores while controlling for CBCL/YSR delinquent behavior. In addition, CBCL-ODD-hurtful but not the YSR-ODD-hurtful also predicted the presence of a violent offense. Based on the two-dimensional model of ODD, CBCL-ODD-headstrong/hurtful scale did not predict the presence of any criminal outcomes. In contrast, YSR-ODD-headstrong/hurtful predicted the presence of any criminal conviction and of any serious driving conviction. The results of the additionally performed

zero-inflated negative binomial (ZINB) regression (see appendix 3) found that the CBCL-ODD-hurtful but not the CBCL-headstrong/hurtful scale or any YSR-ODD-dimension scales was a significant predictor of the number of criminal convictions and the number of convictions for serious driving offenses.

Discussion

Based on the proposed ODD revision of the DSM-5 work group on disruptive behaviors, the present study aimed at testing the constructive, concurrent and predictive validity of ODD-dimensions derived from the CBCL and the YSR. A three-dimensional concept of ODD including ODD-irritability, ODD-headstrong and ODD-hurtful as well as a two-dimensional concept including ODD-irritability and ODD-headstrong/hurtful was compared. So far, no other study has addressed the ability of the ODD-dimensions to predict adult crime.

Construct validity

Similar to youth referred for ADHD (Aebi, et al., 2010), the dimensional structure of oppositionality was replicated and confirmed in a community sample. Both the two-dimensional and the three-dimensional model of ODD was supported. The results suggest that a three dimensional structure of ODD is slightly superior compared to the previously described two-dimensional structure (Rowe, et al., 2010; Stringaris, et al., 2012), in particular, of youth self reports. The present findings support the current proposal for a revision of the DSM-5 ODD-concept. For both the CBCL and YSR, the internal consistencies of the ODD-dimensions were rather limited. This was particularly true for the ODD-hurtful scales that consisted of two items only. Thus, further research based on larger sets of ODD symptoms clearly is warranted.

Concurrent validity

Overall, the concurrent validity of ODD-irritable and ODD-headstrong/hurtful was confirmed with less support for a specific ODD-hurtful dimension.

In agreement with previous studies (Kolko & Pardini, 2010; Stringaris & Goodman, 2009b), the newly developed CBCL- and YSR-ODD-irritability scales were related to concurrent depression and anxiety. Considering the slightly different item composition compared to the DSM-IV criteria, the present findings support the validity of the CBCL- and the YSR-ODD-irritability scale. Furthermore and as shown previously (Stringaris & Goodman, 2009b), ODD-irritability is predicting a broad range of comorbid problems, such as depression, attention problems, and delinquency. The association of irritability with inattention may stem from concentration problems related to emotional disorders.

In line with previous findings (Stringaris & Goodman, 2009b), the parent reported ODD-headstrong scale and ODD-headstrong/hurtful scale were strongly related to attention problems and delinquency and less strongly related to anxiety and depression. Furthermore and as assumed, the parent reported ODD-hurtful scale was related to delinquent behaviors only. However against our assumptions, in multivariate analyses the self-reported ODD-hurtful scale was not related to delinquent behaviors but was associated negatively with depression. In a recent study it was shown that aggressive and cruel behaviors in child soldiers impeded depression and trauma related symptoms (Elbert, Weierstall, & Schauer, 2010). Thus, it might well be that hurtful behaviors reduce feelings of depression in normal youths.

Predictive validity

One of the main findings of the present study is the confirmation of the predictive validity of the CBCL/YSR-ODD-hurtful scales regarding both the presence and the number of later criminal outcomes. The combination of headstrong and hurtful symptoms - as suggested by the two dimensional model of ODD - was not efficient in explaining later criminal behaviors, particularity, when parent information was considered.

Previous studies showed that hurtful behaviors were related to co-existing and later serious aggressiveness (Stringaris & Goodman, 2009a, 2009b) and to negative behavioral outcomes after a modular treatment program (Kolko & Pardini, 2010). In the latter study, ODD-hurtful behaviors significantly predicted ODD and CD as well as self reported vandalism and violence three years later in adolescence. The present study is based on a much longer follow-up period of 15.8 years on average and confirms the importance of child and adolescent hurtful behaviors as risk factor for adult criminal behavior. Interestingly, the CBCL-ODD-hurtful scale was a significant predictor of later criminal convictions even when controlling for co-existing delinquent behaviors. These findings support the assumption that ODD contributes to adult antisocial behaviors independently of CD (Langbehn, et al., 1998). As suggested by Stringaris and Goodman (2009a), the underlying mechanisms of ODD-hurtful may include callous unemotional personally traits that will not become overt when only assessing delinquent behaviors (Frick & White, 2008).

Overall, the findings of the present study support both the two-dimensional and the three-dimensional concept of ODD. The two-dimensional approach may be more economical considering the statistical power of the analyses and should be favored in studies addressing primary outcomes of ODD-irritability. In contrast, the three-dimensional approach with the additional ODD-hurtful dimension is of specific interest in forensic research. Furthermore, the three – dimensional concept should be applied in treatment studies because ODD-hurtful has been identified as a predictor of treatment resistance in CD (Kolko & Pardini, 2010).

Limitations

Although the study was conducted with a representative sample (Steinhausen, et al., 1998), some limitations have to be mentioned regarding the generalization of the findings. Out of 2780 contacted parents, a total of 2192 (78.8%) of the parents were willing to participate in the study. Thus, there was an attrition rate with unknown effects on the findings of the study. Furthermore, the sampling procedure did not control for nationality and migrants were underrepresented in the present sample. A further limitation may stem from the item content

“I’m stubborn, sullen or irritability” which was used in the present study. Although it matches the content of the respective CBCL-item it does not fully match the item content of the original YSR (Achenbach, 1991b) including stubborn behavior only. Therefore, this item from the original YSR is not assumed to load on the irritability dimension. In addition, the predictions of other than criminal behaviors are cross-sectional only. Finally, no self-reported crimes have been considered for criminal outcomes in adulthood.

Strengths

The present study is based on a large community sample with long-term follow-up information on adult crimes. Furthermore, the study adds to the validity of upcoming nosological changes in the classification of ODD and may provide answers to important questions dealing with clinical decision making and the prevention of criminal behavior. Finally, the current findings may stimulate the research on ODD and the development of more comprehensive and clinical useful instruments to assess ODD and it’s dimensions.

Conclusions

First, the differentiation of ODD-irritability, ODD-headstrong, and ODD-hurtful might generally improve our understanding of child and adolescent psychopathology and specifically the relation of ODD to internalizing and externalizing disorders. In particular, for the understanding of criminal behavior the ODD-hurtful dimension is a promising construct that should be assessed independently of other behavioral ODD-symptoms (e.g. headstrong items). Secondly, parent- and self- reported ODD-dimensions are differently related to concurrent mental health problems. Beyond the strong association of self-reported irritability with depression and anxiety, self- reported ODD-irritability concurs also with attention problems and delinquency. In contrast, parent reported headstrong and hurtful behaviors are more specific indicators of concurrent externalizing disorders. Thirdly, the CBCL-ODD-hurtful scale and, to a lower degree, also the YSR-ODD-hurtful and YSR-ODD-headstrong/hurtful scales reflect independent dimensions and represent consistent predictors of later criminal

outcomes as well as of later serious violent outcomes. These findings may also be important for the prevention of crimes. However, taking into account the limited number of items in the present study, the development of more specific instruments for assessing ODD-dimensions in youth is warranted.

Key points

- The recently proposed revision of the concept of ODD by the DSM-5 workgroup suggests different dimensions of ODD in children and adolescents.
- The ODD-irritability dimension is related to concurrent emotional problems as well as to attention problems and delinquent behavior. In addition ODD-headstrong/hurtful is related to concurrent attention problems and delinquency but not to emotional problems.
- The ODD-hurtful dimension predicts later criminal outcomes in adulthood.
- Considering the present findings based on CBCL/YSR-ODD-dimension scales and on DSM-IV ODD criteria, the construction of more elaborated ODD-measures for clinical use is warranted.

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Table 1. *Correlations of the CBCL and YSR ODD-dimension scales*

CBCL / ***YSR***	**1**	**2**	**3**	**4**
1 ODD-irritability	**.318*** **	*.369*** *	*.273*** *	*.395*** *
2 ODD-headstrong	.540***	**.400*** **	*.374*** *	*.886*** *
3 ODD-hurtful	.394***	.367***	**.252*** **	*.761*** *
4 ODD-headstrong/hurtful	.580***	.928***	.687***	**.398*** **

Note: Pearson correlations for the CBCL-ODD-dimension scales under the diagonal, Pearson correlations for the YSR-ODD-dimension scales above the diagonal (in italics), Pearson correlations between CBCL- and YSR-ODD-dimension scales in the diagonal (in bold), CBCL = Child Behavior Checklist, YSR = Youth Self Report, ODD = Oppositional Defiant Disorder

Table 2. Association of CBCL- and YSR-ODD-dimension scales with scores in the clinical range of the CBCL, the YSR and the CES-D based on logistic regression analyses

	CBCL/YSR-Anxious/depressed		CBCL/YSR-Attention problems		CBCL/YSR-Delinquent behavior		CES-D Depression[1]	
Models and predictors	**CBCL data OR (CI)**	**YSR data OR (CI)**	**CBCL data OR (CI)**	**YSR data OR (CI)**	**CBCL data OR (CI)**	**YSR data OR (CI)**	**CBCL data OR (CI)**	**YSR data OR (CI)**
Three-dimensional ODD model								
ODD-irritability	1.58 (1.10-2.26)*	2.25 (1.70-2.97)***	1.81 (1.25-2.63)**	2.36 (1.65-3.39)***	1.41 (1.01-1.99)*	2.01 (1.38-2.91)***	1.41 (1.12-1.78)**	2.25 (1.81-2.80)***
ODD-headstrong	1.21 (0.79-1.85)	1.44 (1.01-2.04)*	1.76 (1.13-2.73)*	1.43 (0.92-2.23)	2.78 (1.82-4.25)***	1.53 (0.97-2.43)	1.05 (0.79-1.39)	1.21 (0.92-1.59)
ODD-hurtful	0.64 (0.29-1.44)	0.78 (0.49-1.25)	1.01 (0.56-2.08)	0.88 (0.53-1.71)	2.88 (1.69-4.89)***	1.58 (0.86-2.90)	0.86 (0.52-1.40)	0.60 (0.40-0.88)**
Model summary								
Nagelkerke R^2 (model sign.)	0.07**	0.24***	0.23***	0.26***	0.43***	0.26***	0.04**	0.21***
Two-dimensional ODD model								
ODD-irritability	1.58 (1.10-2.26)*	2.25 (1.73-3.02)***	1.81 (1.25-2.63)**	2.39 (1.66-3.44)***	1.41 (1.01-1.99)*	2.01 (1.38-2.91)***	1.41 (1.12-1.78)**	2.29 (1.84-2.90)***
ODD-headstrong/hurtful	1.01 (0.72-1.44)	1.13 (0.89-1.43)	1.48 (1.05-2.09)*	1.22 (0.89-1.66)	2.82 (2.0-3.98)***	1.55 (1.11-2.15)**	0.99 (0.79-1.24)	0.92 (0.76-1.11)
Model summary								
Nagelkerke R^2 (model sign.)	0.08**	0.22***	0.22***	0.25***	0.43***	0.26***	0.04**	0.19**

Note. CBCL = Child Behavior Checklist, YSR = Youth Self Report, ODD= Oppositional Defiant Disorder, OR=Odds ratio. [1]=significance (two sided), $p<.010$, *=significance (two sided), $p<.05$, **=significance (two sided), $p<.01$, ***=significance (two sided), $p<.001$, [1]= results are based on a subsample of n=617.

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Table 3. Prediction of adult crime convictions by CBCL- and YSR-ODD-dimension scales based on logistic regression analyses

	Any crime (n=99)		Violent crime (n=12)		Serious driving offenses (n=38)	
Models and predictors	**CBCL date OR (CI)**	**YSR data OR (CI)**	**CBCL date OR (CI)**	**YSR data OR (CI)**	**CBCL date OR (CI)**	**YSR data OR (CI)**
Three-dimensional ODD model						
ODD-irritability	0.86 (0.70-1.05)	0.99 (0.84-1.17)	1.00 (0.61-1.63)	1.39 (0.93-2.09)	0.82 (0.65-1.04)	0.88 (0.72-1.08)
ODD-headstrong	0.98 (0.78-1.24)	1.04 (0.85-1.27)	1.00 (0.54-1.83)	1.52 (0.92-2.51)	1.03 (0.79-1.34)	1.05 (0.82-1.33)
ODD-hurtful	1.68 (1.20-2.36)**	1.38 (1.08-1.78)*	2.12 (1.03-4.37)*	1.29 (0.67-2.53)	1.60 (1.09-2.35)*	1.54 (1.14-2.07)**
Delinquent Behavior	1.36 (1.20-1.55)***	1.20 (1.08-1.33)**	1.08 (0.78-1.49)	0.91 (0.68-1.21)	1.36 (1.18-1.58)***	1.16 (1.02-1.31)*
Model summary						
Nagelkerke R^2 (model sign.)	0.12***	0.07***	0.05 n.s.	0.08 n.s.	0.11***	0.06***
Two-dimensional ODD model						
ODD-irritability	0.86 (0.71-1.05)	0.99 (0.84-1.17)	0.98 (0.60-1.60)	1.40 (0.93-2.10)	0.82 (0.65-1.04)	0.88 (0.72-1.08)
ODD-headstrong/hurtful	1.17 (0.97-1.40)	1.16 (1.01-1.34)*	1.33 (0.85-2.08)	1.43 (0.99-2.06)	1.18 (0.96-1.46)	1.22 (1.04-1.44)*
Delinquent Behavior	1.36 (1.20-1.54)***	1.19 (1.08-1.32)**	1.08 (0.80-1.46)	0.91 (0.68-1.21)	1.36 (1.18-1.57)***	1.15 (1.01-1.29)
Model summary						
Nagelkerke R^2 (model sign.)	0.10***	0.07***	0.04 n.s.	0.08*	0.10***	0.05***

Note. CBCL = Child Behavior Checklist, YSR=Youth Self Report, ODD=Oppositional Defiant Disorder, OR=Odds ratio. ^{t}=significance (two sided), p<.010, *=significance (two sided), p<.05, **=significance (two sided), p<.01, ***=significance (two sided), p<.001.

Figure 1. *Findings from confirmatory factor analysis of eight CBCL/YSR items (Three-dimensional approach). Standardized regression weights, factor-correlations and error-correlations of the items "disobey home" and "disobey school" (for YSR data in italics).*

Note. ODD=Oppositional Defiant Disorder.

Figure 2. *Findings from confirmatory factor analysis of eight CBCL/YSR items (Two-dimensional approach). Standardized regression weights, factor-correlations and error-correlations of the items "disobey home" and "disobey school" (for YSR data in italics).*

Note. ODD=Oppositional Defiant Disorder.