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# Child Personality Accounts for Oppositional Defiant Disorder Comorbidity Patterns

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Oppositional Defiant Disorder (ODD) is a behavioral psychopathology of childhood, characterized by patterns of hostile, defiant, and antagonistic behaviors (American Psychiatric Association 2013). Historically, study of ODD has lagged behind research on other forms of child psychopathology, such as Conduct Disorder (CD). Recently, renewed interest in ODD as an independent construct has elucidated the disorder as a complex and heterogeneous construct (Burke 2012; Burke et al. 2010a; Stringaris and Goodman 2009) with severe consequences (Aebi et al. 2013). Specifically, ODD consists of both *irritable* and *oppositional* symptom domains, which correspond with broader distinctions between distress/negative affect (NA) and disinhibition, respectively. This literature is in line with the idea that ODD is highly comorbid with a wide variety of other disorders (Boylan et al. 2007; Burke and Loeber 2010; Lehto-Salo et al. 2009), and that early ODD predicts later emergence of multiple forms of psychopathology (Burke et al. 2005). This comorbidity pattern positions ODD as a form of early psychopathology with high importance, but also underscores the need for enhanced clarity of ODD as a diagnostic entity. The current study aimed to clarify ODD symptomatology by examining differential patterns of ODD comorbidity in the context of personality and gender.

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Recent investigations have attempted to parse out the heterogeneity of ODD by examining symptom domains and subtypes. In addition to symptoms or subtypes, personality traits, which represent the focus of the current brief report, may also provide a viable way of parsing out the heterogeneity of ODD. In fact, personality traits can be useful in disentangling disorder heterogeneity (Martel 2009; Tackett et al. 2013a) and in understanding disorder comorbidity (Krueger and Markon 2006; Martel et al. 2014; Nigg 2006; Tackett et al. 2013d). Both temperament and personality traits reflect individual differences in regulation, reactivity, cognition, and behavior and are associated with youth psychopathology (De Pauw et al. 2009; Nigg 2006; Tackett 2006). Although measures of child personality and temperament (hereafter referred to as personality) assess highly overlapping trait information, they are nonredundant and thus both are included in this study (De Pauw et al. 2009; Tackett et al. 2013c).

In general, ODD demonstrates a personality profile that is consistent with other externalizing disorders – notably, associations with higher levels of Neuroticism (N)/NA (characterized by anxiety, stress vulnerability, moodiness, anger, and low frustration tolerance), and lower levels of Agreeableness (A; characterized by antagonism and strong will) and Conscientiousness (C)/effortful control (EC; characterized by attentiveness, cognitive control, organization, and planfulness; Herzhoff and Tackett 2016; Tackett et al. 2013a). However, the potential utility of personality for better understanding ODD extends much deeper than surface-level associations. As personality traits reflect a broader domain of psychological characteristics than discrete symptoms, they offer a psychologically rich context for examining disorder manifestation and co-occurrence. In this sense, we might conceptualize personality traits as helping to explain, in psychologically relevant terms, disorder comorbidity.

Considering the irritable and oppositional content of ODD, we can make specific predictions about how underlying personality traits may help account for ODD comorbidity. Marking a tendency to feel emotions such as fear and sadness as well as anger and frustration, high levels of N/NA have been related to both internalizing and externalizing problems (Ormel et al. 2005; Tackett et al. 2013d). Thus, they may be responsible for associations between internalizing and externalizing problems (Keiley et al. 2003). High levels of N/NA are also associated with ODD (Burke 2012; Herzhoff and Tackett 2016), and may thus largely account for the diffuse nature of ODD comorbidity with other forms of psychopathology, both internalizing and externalizing. Alternatively, ODD remains consistently grouped with other externalizing problems, links that are likely explained by shared features of disinhibitory personality (which can be conceptualized by the related traits of low A and C; Markon et al. 2005; Tackett et al. 2013a). Demonstration of such associations empirically would offer an expanded context for understanding the psychological nature of ODD symptoms, vis a vis other forms of child psychopathology.

ODD demonstrates a gender ratio largely distinct from other forms of externalizing problems. Whereas disorders such as CD and attention deficit/hyperactivity disorder (ADHD) are more prevalent in boys, ODD's gender ratio sometimes approaches parity (Loeber et al. 2000; Nock et al. 2007; Rowe et al. 2010). The substantial variance in ODD accounted for by irritability (and its concomitants, such as higher N and more internalizing disorder comorbidity) may at least partially explain why girls are more likely to evidence ODD symptoms than other externalizing symptoms. It is also possible that boys and girls demonstrate different personality-comorbidity patterns that reflect gender-specific thresholds for externalizing disorder emergence. That is, given that externalizing disorders are more common in boys than in girls, manifestation of these symptoms may be less entrenched in broader personality profiles for boys. For example, girls need more risk factors than boys for the expression of other externalizing disorders (Rhee et al. 1999; Van Hulle et al. 2007). As such, if we conceptualize dispositional traits as risk factors, personality may account for the variance in externalizing disorder comorbidity more strongly in girls than in boys. These represent the hypotheses of this brief report: high N/NA and low A and C/EC would account for ODD-comorbidity associations with both internalizing (N) and externalizing disorders (N, A, and C) and such associations would be stronger in girls than boys.

Several causes for the relationship between personality and psychopathology have been proposed (personality may lie on the same spectrum as psychopathology, may be a risk factor for psychopathology, may exacerbate psychopathology, or may be complicated by psychopathology; Tackett 2006). Comprehensive testing of these personality-psychopathology models (such as vulnerability or spectrum models) would require longitudinal data. Nonetheless, such models provide a theoretically rich context to develop hypotheses and to direct analyses in the current study, which relied on cross-sectional data to conduct preliminary tests of these possible associations. Our primary research goal in the current study was to test theoretically driven hypotheses regarding personality-psychopathology associations to examine the explanatory power of personality traits to account for variance in ODD comorbidity, a research question that can be addressed using mediational analysis as a method to account for shared variance owed to another variable, even when agnostic about questions of causality. In other words, establishing hypothesized personality traits as relevant and differentiable in accounting for ODD comorbidity variance is an important first step toward moving to more nuanced and complex research designs to address questions of temporal sequencing, shared causal factors, or relevance for intervention.

## Method

### Participants

Participants were 346 children (49 % boys; $M_{age}$ = 9.96 years, $SD_{age}$ = 0.83; range = 7–12) and their parents. They were recruited through a university-maintained participant database and advertisements in an urban southern Ontario community. Parents reported their child's ethnicity as 71.1 % White, 13.3 % Multiracial, 9.8 % Asian/Pacific Islander, 2.9 % Black, 0.6 % Hispanic, and 0.6 % Other; 1.7 % of parents did not report their child's ethnicity. Parents reported their occupations, which were coded on the 9-point Hollingshead (1975) Occupational Scale, where higher scores reflect a higher household socioeconomic status, and parents' mean score was $M$ = 7.02 ($SD$ = 1.66). Inclusion criteria were English fluency in the child and the caregiver, and exclusion criteria were diagnoses of neurodevelopmental or psychotic disorder or intellectual disability in the child. These exclusion criteria were utilized due to the established norms across most of the questionnaire and interview tasks used in the study.

### Measures

**Child Behavior Checklist** Mothers (279) and fathers (209) completed the 120-item Child Behavior Checklist (CBCL; see Achenbach and Rescorla 2001 for information about the measure's validity), which uses a three-point Likert scale (from 0 = *not true* [*as far as you know*] to 2 = *very true or often true*) to assess children's problem behaviors. Based on Achenbach and Rescorla (2001), items were summed into five DSM-oriented scales separately by reporter: Attention Deficit/Hyperactivity Problems, Oppositional Defiant Problems,

Conduct Problems, Affective Problems, and Anxiety Problems. Mean internal consistency was $\alpha$ = .72 (see Table 1 for the full range).

**Computerized Diagnostic Interview Schedule for Children** One parent (293 mothers and 43 fathers) and the target child completed the Computerized Diagnostic Interview Schedule for Children (C-DISC; see Shaffer et al. 2000 for information about the measure's validity) to assess children's DSM-IV-based psychopathology symptoms. Items were summed into the following DSM-IV criteria counts separately by informant: Major Depressive Disorder (MDD), Separation Anxiety, Social Phobia, ADHD, ODD, and CD. All research assistants who administered these interviews underwent a semester-long training prior to data collection. For a subset of the interviews ($n$ = 21), inter-rater reliability ranged from ICC = .91 to 1.00. Mean internal consistency was $\alpha$ = .67 (see Table 1 for the full range).

**Inventory of Child Individual Differences** Mothers (328) and fathers (227) completed the 144-item Inventory of Child Individual Differences (ICID; see Halverson et al. 2003 for information about the measure's validity) which uses a seven-point Likert scale (from 1 = *much less than the average child or not at all* to 7 = *much more than the average child*) to assess children's personality traits. Items were averaged into five higher-order traits separately by informant, three of which were used for the present study based on study hypotheses: Neuroticism, Agreeableness, and Conscientiousness. Mean internal consistency was $\alpha$ = .91 (see Table 1 for the full range).

**Temperament in Middle Childhood Questionnaire** Mothers (317) and fathers (222) completed the 157-item Temperament in Middle Childhood Questionnaire (TMCQ; see Simonds et al. 2007, and Simonds and Rothbart 2004 for information about the measure's validity) which uses a five-point Likert scale (from 1 = *almost always untrue of your child* to 5 = *almost always true of your child*) to assess children's temperament traits. Items were averaged into three higher-order traits separately by informant, two of which were used for the present study based on the study hypotheses: NA and EC. Mean internal consistency was $\alpha$ = .90 (see Table 1 for the full range).

### Procedure

Participants completed questionnaires at their home and the lab. Both mother and father provided information for 217 children (63 % of the sample). Structured interviews were conducted in the lab. We compensated caregivers with up to $40 CAD for participation in the larger study, and the child received two small gifts. Prior to data collection, we obtained informed consent from the caregivers and assent from the child. The university Research Ethics Board approved the study. Missing data were present in this sample primarily due to the later addition of the CBCL into the testing protocol. Specifically, 279 mothers and 209 fathers provided CBCL data, 335 parents and 342 children provided C-DISC data, 328 mothers and 227 fathers provided ICID data, and 317 mothers and 222 fathers provided TMCQ data. Missing data were not missing completely at random (Little's MCAR $X^2$ = 912.61, $p$ < .001); however, cases with missing data did not differ systematically on psychopathology or personality variables. Missing responses were imputed from available data on our variables of interest only using the expectation-maximization (EM) algorithm in SPSS22.

## Results

Table 1 displays descriptive information. To more accurately approximate the shared information offered by the multiple informants and measures used as well as to eliminate error in reporting, we adopted a latent variable approach, and extracted principal factors across informants and measures. Thus, to compute psychopathology variables, we extracted single principal axis factors from parent and youth C-DISC and mother and father CBCL and saved the regression-based factor scores for ODD (principal axis factor accounted for 43.38 % of the variance), CD (39.93 %), ADHD (53.34 %), MDD (33.04 %), and ANX (Social Phobia and Separation Anxiety; 25.72 %). Specifically, we estimated principal axis factors based on the following a priori identified scales: (1) ODD = CBCL-DSM-Oriented OD Problems mother report + CBCL-DSM-Oriented OD Problems father report + C-DISC Oppositional Defiant Disorder parent report + C-DISC Oppositional Defiant Disorder youth report; (2) CD = CBCL-DSM-Oriented Conduct Problems mother report + CBCL-DSM-Oriented Conduct Problems father report + C-DISC Conduct Disorder parent report + C-DISC Conduct Disorder youth report; (3) ADHD = CBCL-DSM-Oriented ADH Problems mother report + CBCL-DSM-Oriented ADH Problems father report + C-DISC Attention Deficit/Hyperactivity Disorder parent report + C-DISC Attention Deficit/Hyperactivity Disorder youth report; (4) MDD = CBCL-DSM-Oriented Affective Problems mother report + CBCL-DSM-Oriented Affective Problems father report + C-DISC Major Depressive Disorder parent report + C-DISC Major Depressive Disorder youth report; (5) ANX = CBCL-DSM-Oriented Anxiety Problems mother report + CBCL-DSM-Oriented Anxiety Problems father report + C-DISC Social Phobia parent report + C-DISC Social Phobia youth report + C-DISC Separation Anxiety parent report + C-DISC Separation Anxiety youth report.

To compute dispositional trait variables, we extracted single principal axis factors from mother and father ICID and TMCQ and saved the regression-based factor scores for N

**Table 1** Descriptive Statistics for Psychopathology and Personality Trait Variables

| Variables | Cronbach's α | Boys | | Girls | | Gender Differences | |
|---|---|---|---|---|---|---|---|
| | | *M* | *SD* | *M* | *SD* | *t* | *p* |
| CBCL (DSM Scales) | | | | | | | |
| Mother-report | | | | | | | |
| Affective Problems | .62 | 1.43 | 1.80 | 1.46 | 2.08 | −0.15 | .884 |
| Anxiety Problems | .67 | 1.15 | 1.50 | 1.51 | 1.91 | −1.75 | .081 |
| Attention Deficit /Hyperactivity Problems | .84 | 2.97 | 3.08 | 2.77 | 3.07 | 0.55 | .581 |
| Oppositional Defiant Problems | .76 | 2.08 | 2.03 | 2.08 | 2.07 | 0.01 | .991 |
| Conduct Problems | .79 | 1.58 | 2.34 | 1.28 | 2.30 | 1.09 | .277 |
| Father-report | | | | | | | |
| Affective Problems | .61 | 1.09 | 1.65 | 1.24 | 1.63 | −0.65 | .515 |
| Anxiety Problems | .65 | 0.79 | 1.20 | 1.37 | 1.71 | **−2.86** | **.005** |
| Attention Deficit /Hyperactivity Problems | .81 | 2.83 | 2.62 | 2.46 | 2.74 | 1.01 | .313 |
| Oppositional Defiant Problems | .74 | 1.78 | 1.75 | 1.67 | 1.80 | 0.45 | .655 |
| Conduct Problems | .71 | 1.26 | 1.91 | 0.95 | 1.60 | 1.25 | .212 |
| C-DISC | | | | | | | |
| Parent-report | | | | | | | |
| Social Phobia | .86 | 0.38 | 0.95 | 0.43 | 1.06 | −0.46 | .647 |
| Separation Anxiety Disorder | .57 | 0.41 | 0.68 | 0.68 | 1.16 | **−2.57** | **.011** |
| Major Depressive Disorder | .75 | 0.07 | 0.38 | 0.15 | 0.72 | −1.28 | .201 |
| Attention Deficit/Hyperactivity Disorder | .86 | 4.04 | 4.01 | 2.99 | 3.61 | **2.50** | **.013** |
| Oppositional Defiant Disorder | .78 | 1.12 | 1.69 | 1.23 | 1.79 | −0.58 | .566 |
| Conduct Disorder | .32 | 0.25 | 0.57 | 0.20 | 0.54 | 0.88 | .381 |
| Child-report | | | | | | | |
| Social Phobia | .59 | 1.61 | 0.87 | 1.74 | 0.98 | −1.32 | .188 |
| Separation Anxiety Disorder | .69 | 0.55 | 1.09 | 1.17 | 1.58 | **−4.18** | **.000** |
| Major Depressive Disorder | .89 | 0.10 | 0.68 | 0.23 | 1.00 | −1.43 | .154 |
| Attention Deficit/Hyperactivity Disorder | .71 | 1.47 | 2.14 | 1.36 | 1.80 | 0.50 | .615 |
| Oppositional Defiant Disorder | .43 | 0.27 | 0.61 | 0.23 | 0.62 | 0.56 | .576 |
| Conduct Disorder | .60 | 0.25 | 0.78 | 0.13 | 0.45 | 1.65 | .100 |
| ICID | | | | | | | |
| Mother-report | | | | | | | |
| Neuroticism | .89 | 3.37 | 0.81 | 3.39 | 0.85 | −0.20 | .841 |
| Agreeableness | .89 | 4.55 | 0.82 | 4.51 | 0.82 | 0.41 | .682 |
| Conscientiousness | .93 | 4.27 | 0.86 | 4.58 | 0.97 | **−3.14** | **.002** |
| Father-report | | | | | | | |
| Neuroticism | .90 | 3.39 | 0.81 | 3.34 | 0.77 | 0.45 | .654 |
| Agreeableness | .90 | 4.40 | 0.75 | 4.40 | 0.90 | 0.05 | .957 |
| Conscientiousness | .92 | 4.39 | 0.81 | 4.59 | 0.87 | −1.73 | .086 |
| TMCQ | | | | | | | |
| Mother-report | | | | | | | |
| Effortful Control | .87 | 3.37 | 0.37 | 3.54 | 0.41 | **−3.77** | **.000** |
| Negative Affectivity | .92 | 2.35 | 0.47 | 2.54 | 0.55 | **−3.24** | **.001** |
| Father-report | | | | | | | |
| Effortful Control | .87 | 3.33 | 0.37 | 3.45 | 0.38 | **−2.32** | **.021** |
| Negative Affectivity | .93 | 2.40 | 0.47 | 2.51 | 0.50 | −1.77 | .079 |

*CBCL* Child Behavior Checklist (Achenbach and Rescorla 2001); *C-DISC* Computerized Diagnostic Interview Schedule for Children (Shaffer et al. 2000); *ICID* Inventory of Child Individual Differences (Halverson et al. 2003); *TMCQ* Temperament in Middle Childhood Questionnaire (Simonds and Rothbart 2004). Males coded as 0 and females coded as 1 in t-test analyses

Significant effects are highlighted in boldface type. The values in the table are based on the data set without imputed missing responses

(54.78 %), A (55.76 %), and C (67.85 %). Specifically, we estimated principal axis factors based on the following a priori identified scales: (1) N = ICID Neuroticism mother report + ICID Neuroticism father report + TMCQ Negative Affect mother report + TMCQ Negative Affect father report; (2) A = ICID Agreeableness mother report + ICID Agreeableness father report; (3) C = ICID Conscientiousness mother report + ICID Conscientiousness father report + TMCQ Effortful Control mother report + TMCQ Effortful Control father report. Table 2 displays correlations between all factors. Hayes's (2013) PROCESS macro was used to test the hypotheses that (1) personality would account for variance in ODD comorbidity and (2) this effect would be stronger in girls than boys. Bias-corrected bootstrap 95 % confidence intervals were calculated around the indirect effect (ab) and the index of moderated mediation (δ) based on 10,000 bootstrap samples.

**Table 2** Correlation Coefficients for Principal Axis Factor Scores for Psychopathology and Personality Traits Neuroticism, Agreeableness, and Conscientiousness

| Variables | N | A | C |
|---|---|---|---|
| MDD | **.51*** ** | **−.25*** ** | **−.25*** ** |
| ANX | **.50*** ** | .06 | −.10 |
| ADHD | **.29*** ** | **−.38*** ** | **−.74*** ** |
| ODD | **.47*** ** | **−.73*** ** | **−.44*** ** |
| CD | **.24*** ** | **−.57*** ** | **−.44*** ** |
| N | 1.00 | – | – |
| A | **−.43*** ** | 1.00 | – |
| C | **−.39*** ** | **.40*** ** | 1.00 |

*MDD* Major Depressive Disorder, *ANX* Anxiety Disorders, *ADHD* Attention Deficit/Hyperactivity Disorder, *ODD* Oppositional Defiant Disorder, *CD* Conduct Disorder, *N* Neuroticism/Negative Affect, *A* ICID Agreeableness, and *C* Conscientiousness/Effortful Control

***$p < .001$. Significant findings are highlighted in bold-face type

## Personality Accounts for Variance in ODD Comorbidity

We used mediational analysis as a method to account for shared variance owed to another variable. ODD-CD comorbidity was accounted for by N (ab = − .04; CI [−.09, −.004]), A (ab = .11; CI [.03, .20]), and C (ab = .07; CI [.03, .12]). ODD-ADHD comorbidity was accounted for by C (ab = .28; CI [.21, .37]) but not N (ab = .03; CI [−.03, .09]) or A (ab = − .03; CI [−.13, .07]). ODD-MDD comorbidity was accounted for by N (ab = .15; CI [.11, .22]) and A (ab = − .20; CI [−.30, −.11]) but not C (ab = .01; CI [−.04, .06]). ODD-ANX comorbidity was accounted for by N (ab = .23; CI [.15, .33]) and A (ab = − .33; CI [−.48, −.19]) but not C (ab = .00; CI [−.05, .05]). Overall, ODD-externalizing comorbidity was accounted for mainly by personality traits associated with disinhibition (C and A in the case of CD) and ODD-internalizing comorbidity was accounted for mainly by N. To fully interpret the direction of these indirect ab paths, we provide information about the direct a and b paths in Table 3. For example, in the model where C accounts for ODD-ADHD comorbidity, the path a from ODD to C is negative (i.e., ODD is negatively associated with C) and the path b from C to ADHD is negative as well (i.e., C is negatively associated with ADHD after adjusting for ODD), causing the path ab from ODD to ADHD via C to be positive (but nevertheless suggesting that *low* C accounts for ODD-ADHD comorbidity). Notably, after accounting for personality, the direct effects of ODD on the comorbid conditions remained significant with the exception of ODD-ANX comorbidity that was accounted for by N, suggesting that ODD comorbidity is not completely accounted for by personality (with the exception of ODD-ANX comorbidity).

Gender did not interact with N (δ = .05; CI [−.04, .15]), A (δ = −.09; CI [−.25, .08]), or C (δ = .08; CI [−.01, .17]) in accounting for variance in CD comorbidity. Gender did not interact with C (δ = .06; CI [−.08, .22]) in accounting for variance in ADHD comorbidity. Gender did not interact with N (δ = .10; CI [−.01, .21]) or A (δ = −.10; CI [−.29, .09]) in accounting for variance in MDD comorbidity. Gender interacted with N (δ = .18; CI [.04, .35]) but not A (δ = −.23; CI [−.49, .01]) in accounting for variance in ANX comorbidity. Specifically, N accounted for variance in ANX comorbidity less strongly in boys (ab = .14; CI [.07, .24]) than girls (ab = .32; CI [.21, .48]). A summary of these results is

**Table 3** Unstandardized Path Coefficients of Models where Personality Accounts for Oppositional Defiant Disorder (ODD) Comorbidity

| | *B* | $SE_B$ | 95 % CI |
|---|---|---|---|
| ODD-CD Comorbidity Accounted for by N | | | |
| ODD → N (*a*) | 0.47 | 0.05 | [0.38, 0.57] |
| N → CD (*b*) | −0.09 | 0.04 | [−0.17, −0.01] |
| ODD → CD via N (*ab*) | −0.04 | 0.02 | [−0.09, 0.00] |
| ODD-CD Comorbidity Accounted for by A | | | |
| ODD → A (*a*) | −0.69 | 0.03 | [−0.75, −0.62] |
| A → CD (*b*) | −0.16 | 0.06 | [−0.28, −0.05] |
| ODD → CD via A (*ab*) | 0.11 | 0.04 | [0.03, 0.20] |
| ODD-CD Comorbidity Accounted for by C | | | |
| ODD → C (*a*) | −0.46 | 0.05 | [−0.56, −0.36] |
| C → CD (*b*) | −0.16 | 0.04 | [−0.24, −0.08] |
| ODD → CD via C (*ab*) | 0.07 | 0.02 | [0.03, 0.12] |
| ODD-ADHD Comorbidity Accounted for by C | | | |
| ODD → C (*a*) | −0.46 | 0.05 | [−0.56, −0.36] |
| C → ADHD (*b*) | −0.61 | 0.04 | [−0.69, −0.54] |
| ODD → ADHD via C (*ab*) | 0.28 | 0.04 | [0.21, 0.37] |
| ODD-MDD Comorbidity Accounted for by N | | | |
| ODD → N (*a*) | 0.47 | 0.05 | [0.38, 0.57] |
| N → MDD (*b*) | 0.33 | 0.05 | [0.23, 0.42] |
| ODD → MDD via N (*ab*) | 0.15 | 0.03 | [0.11, 0.22] |
| ODD-MDD Comorbidity Accounted for by A | | | |
| ODD → A (*a*) | −0.69 | 0.03 | [−0.75, −0.62] |
| A → MDD (*b*) | 0.29 | 0.07 | [0.15, 0.42] |
| ODD → MDD via A (*ab*) | −0.20 | 0.05 | [−0.30, −0.11] |
| ODD-ANX Comorbidity Accounted for by N | | | |
| ODD → N (*a*) | 0.47 | 0.05 | [0.38, 0.57] |
| N → ANX (*b*) | 0.49 | 0.05 | [0.39, 0.59] |
| ODD → ANX via N (*ab*) | 0.23 | 0.04 | [0.15, 0.33] |
| ODD-ANX Comorbidity Accounted for by A | | | |
| ODD → A (*a*) | −0.69 | 0.03 | [−0.75, −0.62] |
| A → ANX (*b*) | 0.48 | 0.07 | [0.33, 0.62] |
| ODD → ANX via A (*ab*) | −0.33 | 0.07 | [−0.48, −0.19] |

Values for *a* represents the relation of ODD to the personality trait; values for *b* represent the relation from the personality trait to the comorbid condition adjusting for ODD and; *ab* represents the indirect effect of ODD on the comorbid condition through the proposed personality trait. 95 % CIs for the *ab* paths are based on bootstrapping

**Table 4** Summary of how Personality Traits Account for Variance in Disorders Commonly Comorbid with Oppositional Defiant Disorder

| | Comorbid Disorders | | | |
|---|---|---|---|---|
| Personality Traits | Conduct | Attention Deficit Hyperactivity | Major Depressive | Anxiety |
| Neuroticism | ↓ | | ↑ | ↑♀ |
| Agreeableness | ↑ | | ↓ | ↓ |
| Conscientiousness | ↑ | ↑ | | |

↑ = the traits accounts for an increase in symptoms; ↓ = the trait accounts for a decrease in symptoms; ♀ = gender moderates how the trait accounts for the association between Oppositional Defiant Disorder and the comorbid condition

shown in Table 4. All models also tested whether gender moderated the association between ODD and the personality trait and the personality trait and the comorbid condition (only the association between N and A and ANX was moderated by gender; details available on request).[1]

## Discussion

The current investigation provides evidence that personality traits account for ODD-comorbidity patterns. ODD-externalizing comorbidity was accounted for by disinhibitory traits (low A and C). In line with the initial hypothesis, ODD-CD comorbidity was accounted for by low C and A, and ODD-ADHD comorbidity was accounted for by low C, suggesting that low intrapersonal self-regulation (C) is important for comorbidity with both CD and ADHD whereas low interpersonal self-regulation (A) is primarily important for comorbidity with CD. Notably, we also hypothesized that N would explain the link between ODD and externalizing disorders and found that it explained the link with CD as a suppressor variable. Specifically, ODD was positively associated with N, whereas N was negatively associated with CD once ODD was accounted for and the indirect effect of ODD on CD was negative. It seems like once the variance of N that overlapped with ODD (potentially the more externalizing aspects of N such as anger) was accounted for, the variance of N that did not overlap with ODD (potentially the more internalizing aspects of N such as anxiety) was associated with decreased levels of CD. ODD-internalizing comorbidity was accounted for by high N, underlining high distress as a commonality between ODD and internalizing. The current investigation provided limited support that personality accounts for variance in ODD comorbidity more strongly in girls than in boys—this pattern of results was found only for ODD-ANX comorbidity.

[1] We also replicated analyses using only *DSM* symptom counts and found a similar pattern of results with externalizing comorbidity mainly explained by low A and C and internalizing comorbidity mainly explained by higher N. Details are available on request.

These findings emphasize the relevance of N/irritability in understanding ODD and its comorbidity patterns. Consistent with work that distinguished N/irritable symptoms from oppositional symptoms in ODD (Burke 2012; Burke et al. 2010a, b; Stringaris and Goodman 2009), our findings suggest that high N/distress plays an important role in understanding ODD's comorbidity pattern with internalizing disorders. The utility of ODD as a separate diagnostic category has been questioned given its lack of unique predictive validity over CD (see Burke et al. 2010b; Moffitt et al. 2008) and its similarity to normative behavior (see Moffitt et al. 2008); however, ODD seems to explain comorbidity between behavioral and emotional disorders better than CD does (Burke and Loeber 2010; Maughan et al. 2004). High N is an important aspect of many kinds of child psychopathology (Tackett et al. 2013d) that might further explain ODD's diffuse and ubiquitous nature. ODD's large component of N in addition to its low self-regulatory content, and the importance that N plays in explaining ODD's comorbidity pattern, might be why ODD seems like an unspecific diagnostic category. Personality (N vs. low self-regulatory traits) may help foreshadow which children captured in the non-specific ODD category will develop distinct internalizing (N) versus externalizing disorders (low C and A).

Additionally, our results can be considered in the context of recent work reconceptualizing diagnostic comorbidity in terms of a broad general psychopathology factor (e.g., Caspi et al. 2014; Lahey et al. 2012). Using a twin study, variance in the general factor of psychopathology is largely shared with variance in N at both a phenotypic and a genetic level, consistent with evidence for a spectrum model (Tackett et al. 2013d). In addition, findings from this research clearly illustrate the utility of cross-sectional phenotypic analyses as a first step in testing more nuanced models of personality-psychopathology associations. Studies in children also suggest that ODD has a unique relationship with the general factor of psychopathology such that, besides MDD and generalized anxiety disorder, ODD has one of the highest loadings on the general factor, sometimes even higher than its loading on the higher-order externalizing factor (Olino et al. 2014; Tackett et al. 2013d). This evidence, as well as the centrality of N

for explicating ODD comorbidity in the current study, further supports the potential relevance of ODD for better understanding the emergence of the general psychopathology factor and closely related transdiagnostic constructs such as trait N.

Although we hypothesized that personality may account for the variance in ODD comorbidity more strongly in girls than in boys, we found a lack of gender-specific patterns (with the exception of ANX). This lack of gender-specificity is in line with a general lack of gender differences in ODD prevalence rates (Loeber et al. 2000; Nock et al. 2007; Rowe et al. 2010) and suggests that personality traits seem to be equally relevant for explaining boys' and girls' manifest ODD behaviors, with the exception of ANX comorbidity. This suggests that at least manifestation of ODD-ANX comorbidity may be more entrenched in a personality profile characterized by high N in girls than in boys. Given that we did not predict that personality would account for ODD comorbidity specifically with ANX more strongly in girls than boys (we predicted that this was going to be generally true of all comorbid conditions), future studies should replicate our finding with ANX. It will be especially important to further understand gender differences in the psychological nature of ODD-ANX comorbidity as well as ANX by itself as gender also moderated how personality related to ANX symptoms themselves.

## Limitations and Future Directions

The present study is not without limitations. Given the cross-sectional design, it is impossible to determine the mechanism by which personality exerts its influence (e.g., whether personality exacerbates the disorders or is being exacerbated by the disorders; Martel et al. 2014; Tackett 2006). Longitudinal research can elucidate the mechanisms by which personality exerts influence on disorder comorbidity. Seminal work by Caspi et al. (1995) found Lack of Control (i.e., disinhibition) to predict externalizing more strongly than internalizing over time, consistent with personality associations presented here. Such longitudinal designs can test whether the traits identified here will also predict comorbidity over time and begin to tease apart causal hypotheses. Thus, next empirical steps that might follow from our analyses presented here may include the use of longitudinal designs to test whether personality constitutes a vulnerability for comorbidity or whether personality and comorbidity share common causal factors.

Furthermore, the results may be influenced by shared method variance resulting from obtaining psychopathology and personality data from parent report. Informant discrepancies are common within child psychopathology research (De Los Reyes and Kazdin 2005; Tackett et al. 2013b). It is likely that different informants possess different information about the target based on their relationship and differential exposure to behavior in particular contexts (De Los Reyes and Kazdin 2005; Tackett et al. 2013b). Future studies should include multiple informants, such as teachers, as school is a context different from the home environment but relevant for ODD behaviors. Additionally, the internal consistency of some of the scales, especially those assessing internalizing problems, was relatively low, which may have reduced our statistical power for detecting statistically significant results. We adopted a latent variable approach to address this limitation; however, future studies interested in specific disorders and/or informants may do well in taking into account this pattern in their study design. Finally, this study used a community sample of participants; these results may not generalize to more severe clinical populations, children with neurodevelopmental disorders or those individuals who are not fluent in English. Future studies should replicate these findings in these additional populations.

## Clinical Implications

The current findings are limited to a community-based sample; nonetheless, ODD is a highly common childhood disorder, which positions community-based samples as advantageous for examining ODD manifestation and associations with broadly distributed dimensions such as child personality. Anticipating that such associations may be generalizable to clinical samples, some specific potential applications might be proposed.

Assessments are often constrained by time and resources, particularly in applied clinical and educational settings. The current results suggest that diagnoses of ODD may warrant more extensive assessment of a variety of comorbid conditions and personality screening measures may help steer clinicians in the right direction. As is suggested in Section III of the recent DSM 5, personality traits can help clinicians in case conceptualization even if the individual is not thought to have a personality disorder (American Psychiatric Association 2013). Brief personality instruments can be implemented quickly and cost-effectively (e.g., by sending parents questionnaires in advance of coming to the clinic and/or having clinicians complete personality ratings following the visit), and may yield substantial information that may be helpful for personalization of treatment approaches. For example, clinicians should note that ODD appears to represent more than "just" an externalizing disorder, and careful attention to comorbid depression and anxiety may lead to a more nuanced diagnostic profile and treatment recommendations. Furthermore, attention to comorbid conditions in children with ODD may facilitate a focus on those intervention mechanisms most relevant to a given child. Whereas ODD-externalizing disorder comorbidity may respond best to structured behavioral interventions typically used with CD and ADHD, in cases where ODD is instead comorbid with

internalizing problems, interventions may be best served by targeting the underlying distress and NA through appropriate therapeutic and psychopharmacological efforts. The relevance of personality in tailoring ODD interventions is thus a pertinent future direction.

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**Compliance with Ethical Standards**

**Conflict of Interest** The authors declare that they have no conflict of interest.

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