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ORIGINAL ARTICLE

Parental Etiological Explanations and Longitudinal Medication Use for Youths with Attention Deficit Hyperactivity Disorder

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Abstract Due to the need to increase understanding of factors associated with medication usage for youth with ADHD, this study examined parental explanatory etiologies in relationship to psychotropic medication use in a sample of youth who met criteria for ADHD and utilized outpatient specialty mental health services in the previous year. When examined cross-sectionally, medication usage was positively associated with parental explanatory etiologies related to physical causes and negatively associated with those involving sociological causes. Longitudinal analyses did not show a significant effect of Time 1 parental explanatory etiologies on the slope of medication use, suggesting that the relationship between Time 1 parental explanatory etiologies and medication usage remains stable over time for those who have had past year involvement with outpatient specialty mental health services.

Keywords Attention deficit hyperactivity disorder · Medication · Explanatory etiologies · Mental health · Beliefs · YouthChild · Adolescent

Introduction

Successful psychopharmacological treatment of psychiatric disorders requires medications with proven effectiveness as well as patient receptivity to the use of these medications. Substantial evidence now exists for the effectiveness of medications, particularly stimulants, in the treatment of attention deficit hyperactivity disorder (ADHD) either

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alone or in combination with behavioral interventions (The MTA Cooperative Group 1999). The efficacy of stimulant medications in decreasing ADHD core symptoms has been adequately demonstrated in a number of landmark studies (e.g., Abikoff et al. 2004b; Elia et al. 1999; Faraone 2009; Goldman et al. 1998; The MTA Cooperative Group 1999). The benefits of stimulant treatment for youth with ADHD are further evidenced by studies that show positive associations with academic achievement (Hechtman et al. 2004; Powers et al. 2008; Scheffler et al. 2009), school functioning (Barbaresi et al. 2007; Biederman et al. 2009), emotional functioning (Biederman et al. 2009; Hechtman et al. 2004), and social functioning (Abikoff et al. 2004a). In response, both the American Academy of Pediatrics (AAP) and the American Academy of Child and Adolescent Psychiatry (AACAP) have published guidelines citing stimulant medications as an evidence-based treatment for ADHD (American Academy of Pediatrics 2011; Pliszka and AACAP Workgroup on Quality Issues 2007).

Despite this well-established research base, there is concern that appropriate medication treatments are not consistently received by all youth with ADHD. Nationally, 7.8 % of youth aged 4–17 years had a reported attention-deficit/hyperactivity disorder diagnosis, but only 4.3 % had both the diagnosis and were currently taking medication for the disorder (Visser et al. 2007). Rowland et al. (2002) found through parental report that only 71 % of school-age children who had received a diagnosis of ADHD in their lifetime were currently or ever taking medication to alleviate ADHD symptoms. Even more striking, Bauermeister et al. (2003) found that of Latino/Hispanic youth diagnosed with ADHD through a structured parental interview, only 7 % reported utilizing medication treatment in the past year. These results support Jensen et al.'s (1999) findings that only 12.5 % of children meeting ADHD diagnostic criteria in the community per parent report had been treated with stimulants during the past year (Jensen et al. 1999).

Medication treatment adherence rates have also been examined. Existing research reveals that ADHD medication regimens are often marked by periods of inconsistent use (Winterstein et al. 2008), with reports of 50–75 % psychostimulant adherence at 12 months (Charach et al. 2008). In a high-risk sample of elementary school students, Bussing et al. (2005) found that approximately one-third of those children who had received ADHD medications at their Time 2 interview were no longer on medication after 12 months. Similarly, a recent study with 127 parents of children with ADHD who had recently initiated ADHD medication revealed that 21 % discontinued the medication within the first year (Toomey et al. 2012). Utilizing claims data from six health plans, a separate study revealed that children who were newly treated for ADHD were only adherent to a specifically prescribed treatment regimen for an average of 34.2 days (SD = 75.6, range 0–547; Perwien et al. 2004), which is similar to other findings that the average time to discontinuation for medication is 4 months (Marcus et al. 2005). In addition, an examination of physiological adherence over a period of 14 months on a subset of ADHD youth from the MTA study revealed that nearly one-fourth (24.5 %) of the saliva samples indicated non-adherence to the medication regimen, and only 53.5 % of the youth participants were adherent at every time point at which saliva assays were collected (Pappadopulos et al. 2009).

It is possible that these wide ranging rates of medication use and adherence may be explained in part by parental perceptions as to the cause, course, and cure of their child's problems. Parental explanatory models for illness, along with treatment acceptability and expectations, have been shown to alter diagnostic and treatment patterns, including medication usage, for psychiatric disorders (Sussman et al. 1987; Westermeyer 1987). The relationship between parental beliefs and treatment use has also received examination specific to youth with ADHD. Some research shows that parental knowledge and/or beliefs about the causes, course, and/or interventions for ADHD may explain medication treatment enrollment (Leslie et al. 2007; Johnston et al. 2005), parental acceptability of treatment options including medications (Krain et al. 2005; Leslie et al. 2007; Davis et al. 2012), and medication treatment acceptance over time (Leslie et al. 2007) for youth with ADHD. Additionally, dosReis et al. (2009) found evidence demonstrating an association between positive parental views of ADHD medication and continuity of ADHD medication use. Parental beliefs that the medication is safe and adequately effective in reducing problem behavior also influence adherence to the medication regimen (Toomey et al. 2012; Johnston et al. 2005), and expectancies about perceived advantages to medication treatment are posited to be partly responsible for the decision to initiate a stimulant regimen (Chaco et al. 2010). However, there are also reports that knowledge and beliefs about ADHD were not associated with treatment recommendation pursuit (Leslie et al. 2007) and parental knowledge of ADHD was not linked to long-term treatment adherence (i.e., over a year) (Corkum et al. 1999). These mixed findings indicate the need for further examination of the relation between specific patterns of beliefs about causes for ADHD and service use (Davis et al. 2012).

It is possible that parental beliefs that are more consistent with a physical cause may facilitate greater use of and compliance with medication services for ADHD. For instance, one might assume that having a physical health-related explanation for an emotional or behavioral problem would be associated with a greater willingness to use medication treatments. In fact, it has been found that parental etiological beliefs related to physical causes (PHYS) were

associated with later specialty MH service use for children (Yeh et al. 2005), and African American parents who endorsed biological origins to ADHD were more likely to persist in mental health services one year after their child was diagnosed (Mychailyszyn et al. 2008). It is possible that a relationship between parental etiological explanations and service use may be even more pronounced for etiological beliefs related to PHYS and psychotropic medications due to the nature of medications, while those beliefs that are more sociological or spiritual in nature may deter medication usage. In fact, endorsement of biological/genetic causes of ADHD has been found to predict preferences for medication use in a sample of parents, 48.7 % of whom reported having a child with ADHD (Pham et al. 2010). Parents who believe that ADHD is an organic condition with biological underpinnings, rather than a psychological or environmentally-based condition, are more likely to encourage children to take stimulant medication (Johnston et al. 2005). The belief that ADHD is "real," which was at least in part operationalized as accepting biomedical understandings, predicted treatment preference for medication over counseling in a study assessing public awareness (McLeod et al. 2007). In addition, a qualitative study with a small sample in a single geographic area found that parental beliefs were associated with different temporal patterns of medication use (Leslie et al. 2007). These studies lend support for further examination of the relationship between parental etiological beliefs and actual medication usage for youth with ADHD.

The research to date indicates a need to promote appropriate medication treatment for youth with ADHD, and although the findings are somewhat mixed, the literature suggests that understanding parental conceptualizations related to ADHD may be important for promoting appropriate usage of and adherence to medication treatment of ADHD. The present study seeks to contribute to the literature by examining parental beliefs about the causes of child problems in relationship to psychotropic medication usage both cross-sectionally and over a 2-year period in a sample of at-risk youth who meet criteria for ADHD based upon a standardized interview and who have utilized outpatient specialty MH services during the past year. Our hypotheses are as follows:

(1) When assessed cross-sectionally, parental explanatory etiologies associated with PHYS will be positively related to psychotropic medication use at Time 1 interview, while sociological (SOC) and spiritual/nature disharmony (SND) beliefs will be negatively related to psychotropic medication use.
(2) When assessed longitudinally, endorsement of SOC or SND beliefs at Time 1 interview will be associated with a steeper decline in medication usage across a two-year period, as will an absence of physical cause belief endorsement.

Methods

Study Sample

Participants were a subsample of the "Patterns of Youth Mental Health Care in Public Service Systems" survey [Patterns of Care (POC)] which involved a stratified random sample of 1,715 youth aged 6–17 who received services in one or more of five public sectors of care [alcohol/drug, child welfare, juvenile justice, mental health, public school services for youth with serious emotional disturbance (SED; now called ED)] in a large, metropolitan county in the second half of the 1996–1997 fiscal year. The juvenile justice sector involved only adjudicated delinquents, and the child welfare sector included only court-ordered dependents [see Garland et al. (2001) for more information on sampling methodology]. The subsample for the current study was selected based on (1) meeting criteria for ADHD on the DISC-IV (described below; $n = 444$), (2) usage of outpatient specialty MH services during the past year (reduction to $n = 320$), and (3) presence of data for the independent variables and covariates included in our model (reduction to $n = 304$), resulting in a sample size of 304 youths. The sample included 48 (15.8 %) African Americans, 2 (.7 %) Asian American/Pacific Islanders, 38 (12.5 %) Latinos, 203 (66.8 %) non-Hispanic Whites, 3 (1.0 %) who were bi-racial, and 10 (3.3 %) other or unknown, and 68.1 % ($n = 207$) were male. Youth mean age at the time of first interview was 13.02 years (SD = 3.16). 13 (4.3 %) had received services from alcohol/drug treatment, 62 (20.4 %) from child welfare, 35 (11.5 %) from juvenile justice, 210 (69.1 %) from mental health, and 130 (42.8 %) from public school special education services for youths with SED during the 1996–1997 fiscal year. Median household income for the sample was $25,000–$34,999 per year, and 13.2 % of adult caregiver respondents had no high school diploma, 45.3 % had a high school degree or equivalent, 24.4 % had an Associates or vocational/technical degree, 16.4 % had a Bachelors level or higher degree, and .7 % were missing this information.

Procedures

Interviews of parents or primary caregivers (hereafter referred to as parents) and youth took place at Time 1, and at approximately 6 months, 12 months, 18 months, and 2 years, resulting in five data collection time points. Time 1 and 2 year follow-up interviews were conducted in person, and 6, 12, and 18 month follow-up interviews took place via telephone. Interviews included data collection of demographic characteristics, symptomatology, functioning level, explanatory etiologies for the child's problems,

service use, and medication use. Institutional review board approval and informed consent were obtained prior to data collection. Parents received $40 for face-to-face interviews and $10 for telephone interviews, and youth received $10–$40 depending on age for their participation at each time point.

Measures

Family Income

Family income was assessed using an incremental scale developed by the UNOCCAP (Use, Needs, Outcomes, and Costs in Child and Adolescent Populations) Work Group. This measure allowed participants to select a value (range 1–32) that corresponded with levels of income ranging from <$1000 to $200K.

Diagnostic Interview Schedule for Children (DISC-IV; Shaffer et al. 2000)

A diagnosis of ADHD was determined by the DISC-IV. This measure is an established structured diagnostic interview that generates categorical DSM-IV diagnoses for youth with demonstrated reliability and validity (Shaffer et al. 2000). A diagnosis was considered present if full criteria were met without regard to specific diagnostic impairment on scoring algorithms for caregiver or youth (age 11 and up) report.

Beliefs About Causes of Child Problems-Parent Version (BAC-P; Yeh and Hough 1997)

The BAC-P was used to assess parental etiological explanations for their child's problems. This semi-structured questionnaire was developed for the POC study based upon literature review, expert cultural consultation, and prior research. The questionnaire involved 11 belief scales: PHYS (eight items), Personality (five items), Relational Issues (four items), Familial Issues (four items), Trauma (two items), Friends (four items), American Culture (three items), Prejudice (one item), Economic Problems (three items), Spiritual Causes (10 items), and Nature Disharmony (four items). Participants responded yes/no to questions as to whether or not they believed their child's problems were caused by issues in each of these eleven global areas. "Yes" responses to a global question led to specific questions within each particular category, with the exception of the Prejudice category, which consisted of a single question. A dichotomous variable was created for each of the 11 categories, representing endorsement of any item within that category (yes/no). Pilot 1-week, test–retest reliability testing (average time between telephone administrations = 8.23 days; $n = 23$ parents) with a separate sample resulted in kappas corresponding to "excellent reproducibility" or >85 % agreement between administrations for 7 of the 11 scales, "good reproducibility" for two of the scales, and "marginal reproducibility" (using kappa guidelines from Rosner (1995) for two of the scales). The PHYS category (unweighted % yes endorsement = 54.3) will be utilized in this study's analysis.

Three broad etiological areas were identified from these 11 scales: biopsychosocial (PHYS, Personality, Relational Issues, Familial Issues, Trauma), SOC (Friends, American Culture, Prejudice, Economic Problems), and SND (Spiritual Causes, Nature Disharmony). Confirmatory factor analysis (CFA) examined the groupings of the 11 etiologic categories into broader biopsychosocial, SOC, and SND domains. A CFA conducted with a restrictive model that did not allow for cross-loading of items found adequate fit for both an a priori two-factor model (biopsychosocial vs. SOC/SND) and an a priori three-factor model (biopsychosocial vs. SOC vs. SND). The models did not differ, and the three-factor model met the interpretability criterion [comparative fit index (CFI) = .91; root-mean-square error of approximation (RMSEA) = .05] and so was employed in this study. Three non- mutually exclusive variables allowed for parental endorsement (yes/no) across three broad etiological domains: biopsychosocial, SOC, and SND. The SOC (unweighted % yes endorsement = 61.8) and SND (unweighted % yes endorsement = 11.2) domains will be included in the study analysis.

Psychotropic Medication Use

Medication use at Time 1 ($n = 297$), 6 month ($n = 287$), 12 month ($n = 290$), 18 month ($n = 291$), and 2 year ($n = 291$) follow-up was assessed using questions modified from the Services Use and Risk Factors (SURF) Questionnaire [Service Use Committee of the Utilization, Needs, Outcomes, and Costs in Child and Adolescent Populations (UNOCCAP) study; Leaf, personal communication, November 1996]. Parents/caregivers were asked about psychotropic medication use for their child's emotional and/or behavioral problems during the past 6 months with up to five medications provided in response. Studies have shown substantial test–retest reliability for past-year use of medications and number of medications, but poor agreement for dosage (Canino et al. 2002; Horwitz et al. 2001).

Past-year Use of Outpatient Specialty Mental Health Services at Time 1 Interview

The study selected only those youth who had outpatient specialty MH service use in the past year. Mental health

service use was assessed using the Service Assessment for Children and Adolescents (SACA; Horwitz et al. 2001) which has demonstrated adequate reliability and validity (Hoagwood et al. 2000; Horwitz et al. 2001; Stiffman et al. 2000). Past year outpatient specialty MH service use at Time 1 interview was defined as any use during the past year of outpatient specialty MH services, including visits to professional psychologists/counselors/community mental health clinics and partial hospitalization or day treatment programs.

Data Analysis

We examined psychotropic medication use over time to estimate a growth model with a binary dependent variable indicating psychotropic medication use at Time 1, 6, 12, 18, and 24 months. A growth model was estimated examining intercept (Time 1) and slope (over time) parameters regressed on each of the primary independent variables (PHYS, SOC, and SND beliefs) and controlling for youth gender, youth age, and family income. The model was estimated using the Mplus data analysis program (Muthen and Muthen 1998) with weighted least squares estimation and sampling weights included to account for the complex sample design. Indicators of model fit were assessed according to recommended criteria (Dunn et al. 1993; Hu and Bentler 1998; Hu and Bentler 1999; Kelloway 1998) including the Chi square statistic, a CFI near .95 or greater, a Tucker-Lewis index (TLI) near .95 or greater, a RMSEA close to .06 or less, and a weighted root mean residual (WRMR) close to .80 or higher (Muthen and Muthen 1998). These values result in lower Type II error rates with acceptable costs of Type I error rates (Hu and Bentler 1999). The χ^2/df ratio was also examined in which a value of 3 or greater indicates poor fit (Mueller 1996). The overall trajectory for all youths in the study from the unconditional growth model shows a decrease in proportion of youths using medication over time, ranging from an unweighted 62.0 % of those who responded at Time 1 to 49.8 % of valid responses at 24 months. Pearson correlations for medication usage between all timepoints ranged from .463–.815 for available data.

Table 1 shows regression results for the substantive model. The model demonstrated good fit (χ^2 (25) = 100.919, $p < .0001$, CFI = .993, TLI = .989, RMSEA = .100, WRMR = .918).

Our first hypothesis was that explanatory etiologies related to PHYS would be positively associated with medication usage while SOC and SND beliefs would be negatively associated with medication usage when examined cross-sectionally. An examination of the intercepts of our model showed that beliefs related to PHYS were positively associated with medication usage at Time 1 ($p < .01$) and that SOC beliefs were negatively related ($p < .05$). There was no relationship between SND beliefs and medication usage at Time 1. Regression coefficients (B) for covariates show that female gender ($p < .001$) and older age ($p < .01$) were associated with lower likelihood of medication use at Time 1, while higher income was associated with a higher likelihood of medication use at Time 1 ($p < .01$).

Table 1 Standardized regression coefficients, unstandardized regression coefficients, and standard errors for independent variables and covariates predicting intercept and slope of parental beliefs about the causes of child problems on medication usage

Variable	*B**	*B*	*SE*
Intercept			
Gender	−.307***	−.800	.187
Age	−.225**	−.086	.031
Income	.187**	.034	.013
Physical	.218**	.537	.179
Sociological	−.168*	−.423	.192
Spiritual/nature disharmony	−.088	−.347	.260
Slope			
Gender	.155	.064	.048
Age	−.255*	−.016	.007
Income	−.388**	−.011	.003
Physical	−.106	−.041	.044
Sociological	.163	.065	.047
Spiritual/nature disharmony	.175	.110	.069

$N = 304$; *gender* male = 1, female = 2; *B** = standardized regression coefficient; *B* = unstandardized regression coefficient; *SE* = standard error

* $p < .05$, ** $p < .01$, *** $p < .001$

Our second hypothesis was that the Time 1 report of SOC and SND beliefs as well as the lack of endorsement of explanatory etiologies related to PHYS would be associated with a steeper decline in medication usage over time. Contrary to our hypothesis, there were no significant relationships noted for physical, sociological, or SND causes. With respect to our covariates, older age ($p < .05$) and higher family income ($p < .01$) were associated with a steeper decline in medication use over time (see Table 1 for standardized and unstandardized regression coefficients and standard errors for all beliefs and covariates included in the model).

Discussion

The present study examined parental beliefs about the causes of child problems in relationship to psychotropic medication usage in a sample of at-risk youth with ADHD who utilized outpatient specialty MH services in the

previous year. Analysis yielded significant relationships between parental explanatory etiologies and medication usage when examined cross-sectionally at first interview, but no significant relationships between the Time 1 beliefs of interest and change in medication usage over time. The findings regarding slope may also suggest that initial beliefs supported continued medication use at the baseline level over the course of the study.

Our first hypothesis was that when examined cross-sectionally, parental explanatory etiologies related to PHYS would be associated with higher medication usage while SOC and SND etiologies would be related to lower medication usage. Support was found for this hypothesis as it related to physical and SOC causes, even when taking the other belief areas into account, but not for SND etiologies. These findings are generally consistent with previous research on youth with ADHD that indicates a relationship between parental knowledge and/or beliefs about ADHD behaviors and enrollment in empirically supported treatments such as stimulant medication (e.g., Johnston et al. 2005), parental acceptability toward medication treatment and pursuit of pharmacotherapy for ADHD (e.g., Krain et al. 2005). These studies suggest the importance of understanding parental etiological explanations in medication usage for youth with ADHD, particularly as they relate to physical and SOC causes. The lack of a finding related to SND etiologies may indicate other factors (e.g., concerns regarding stigma, family member or mental health professional opinion, functional impairment, medication access issues) may play a larger role than this parental etiological explanation for the medication usage of youth who have had prior exposure to outpatient specialty MH services.

Analyses did not support our hypothesis of a steeper decline in medication use over time for the children of parents who endorsed SOC or SND beliefs or who did not report PHYS. This suggests that the relationship between Time 1 explanatory etiologies and medication usage remains relatively stable across a 2-year period suggesting that Time 1 beliefs may be related to future beliefs and medication use at later time points. This may be due to the possibility that parental explanatory etiologies remained unchanged over time, such that the effect of parental beliefs upon medication usage remained constant. However, Davis et al. (2012) have suggested that parental views on the cause of ADHD are mutable over time, particularly in the context of a shared decision-making approach to treatment between the parents and prescriber. It is possible that the youths in our sample had been in services long enough that their parents' views had already been crystallized. Alternatively, while explanatory etiologies may be related to medication usage when examined at a single point in time, other factors such as family, community, specialty mental health provider, and economic influences may play a larger role in changing medication use trajectories over time for youth who have utilized outpatient specialty mental health services in the past year. It may be beneficial for future research to examine the influence of parental explanatory etiologies at treatment initiation upon longitudinal medication use as well as examine changes in beliefs over time in relationship to medication treatment adherence.

The findings must be interpreted within the context of the sample, which involved parents of youth who had used outpatient specialty MH services in the previous year. As such, these families had contact with mental health professionals within the last year, whereas some of the samples in other studies in the literature (e.g., Krain et al. 2005; Leslie et al. 2007) were not necessarily solely comprised of those with specialty MH service use histories. Therefore, it is possible that the parents in the current study may, by virtue of past or current outpatient specialty MH service use, have characteristics that would make them more amenable to the use of medications in treatment at any given time point compared to those early in the ADHD treatment decision-making process or receiving care solely through non-specialty sectors. For example, these parents may possess more knowledge about ADHD which has been shown to predict acceptability of medication (Bennett et al. 1996), have already overcome barriers to MH service use that may also apply to medication usage, possess greater motivation for service receipt, have the benefit of counsel from a MH service provider or positive experiences with the medical system in the past, or have a social network that encourages their pursuit of medication treatments (Leslie el al. 2007). If it is indeed possible that those who have contact with outpatient specialty MH services may be more likely to be open to medication usage regardless of parental explanatory etiologies, it is striking that the presence of PHYS and the report of SOC causes were significantly associated with medication usage when examined cross-sectionally. In addition, the factors that influenced initial entry into outpatient specialty mental health services may have continued to impact the family (and decisions regarding medical treatment) across the 2-year follow-up period. Alternatively, the family may have been influenced by the mental health professionals who may have had maintained or increased involvement with the youths over time.

Several limitations of this study must be noted. First, this study sample was drawn from a larger sample of at-risk youth who had contact with public sectors of care. While this provided a rich sample of outpatient specialty MH service users from school, juvenile justice, child welfare, alcohol/drug, and MH settings, it is not known if factors specific to particular sectors may have influenced medication usage in some way. Second, because the study was not designed to measure parental beliefs at the start of services, we were not able to ascertain if beliefs preceded service use or vice versa in our cross-sectional analyses. Third, the construction of the etiological measure and variables

included in the study may have limited the ability of the study to detect significant findings. For example, we utilized a category of the BAC-P alongside of two domains of the measure, and the dichotomous nature of the beliefs variables did not allow for indications of endorsement strength. In addition, the number of parents who endorsed SND beliefs was of adequate size to detect an effect, but was comparatively small in the context of the entire study sample. Other means of beliefs measurement may have yielded different results. Fourth, parental explanatory etiologies were assessed generally, without a specific focus upon ADHD. Fifth, it is unknown whether the outpatient specialty MH services received were focused upon ADHD as a primary problem. Sixth, the current study did not require specific diagnostic impairment in order to meet criteria for a diagnosis, and future studies may like to examine the role of functional impairment in relationship to explanatory etiologies and medication usage. Nonetheless, the study provides both cross-sectional and longitudinal information about the relationship between parental etiological explanations and medication usage in a highly clinically-relevant sample of racially/ethnically-diverse youth who met criteria for ADHD and who utilized outpatient specialty MH services in the past year. Medical professionals are urged to take parental attributions for the causes of their child's problems into account when making recommendations for the use of psychotropic medications and to work with parents over time to find treatment(s) that are effective as well as congruent with the family's belief systems.

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