to take medication, and feeling better [7]. Also, external factors such as negative parental attitudes about medication and lack of support from family members are related to medication nonadherence in children/youth [8–10]. Previous research has found that absence of parental assistance with medications predicted nonadherence in children/youth [11, 12], and parents’ perception of medication can impact their child/youth’s opinion of prescribed psychotropics [13, 14]. Parent personality type can also play a role, with high conscientiousness associated with positive communication with service providers and involvement in the medication routine facilitating child/youth medication adherence. Conversely, high parental neuroticism has been found to be associated with child/youth nonadherence and disengagement from health-related decisions [4]. Other mechanisms by which the family influences adherence have been relatively unexplored within child populations.

In adult populations informal sources of support from extended family and friends have been found to have a positive impact on taking medications as prescribed [15, 16], and lack of social support has been associated with medication nonadherence [17]. While the family is certainly a core source of support for children/youth and an established factor in medication adherence, there is a paucity of research...
investigating whether informal support available to the family by extension is associated with child/youth medication adherence. Availability of informal support to the family of young people is often overlooked when the direct focus of intervention is assisting the child/youth [18].

Given the limited extant literature, the primary objective of the present study was to explore the relation between medication nonadherence for children/youth with complex needs and family dynamics. Specifically, this objective was designed to further understand if parents who are stressed, overwhelmed with the child/youth’s condition, and critical or hostile towards the young person have a higher likelihood of their child/youth’s nonadherence to psychotropic medication. A second objective was to extend the research on the association between informal support and adult medication adherence to child/youth populations by investigating whether families who lack support from extended family and friends for life challenges have children/youth who are nonadherent to prescribed psychotropic medications.

Method

Participants

Clinical data collected from 2012 to early 2020 was used from 10,225 children and youth ages 4–18 years old ($M_{age} = 12.72, SD = 3.32; 58.1\%$ male, 41.6\% female, 0.3\% other) who were prescribed psychotropic medication and receiving services from 50 mental health agencies across Ontario. The participants were assessed using the interRAI™ Child and Youth Mental Health (ChYMH) or the interRAI Child and Youth Mental Health – Developmental Disability (ChYMH-DD) instrument at the agencies where they were receiving services for emotional and behavioural challenges (including developmental disabilities, autism, and mental health concerns; 92\% outpatient, 8\% inpatient). Assessment type in the current study was the initial assessment which typically occurs at intake. Ethics clearance for secondary data analyses was obtained from Western University (REB #106415).

Psychiatric presentation. The reason for referral to mental health services was danger to self and/or others for 53\% of the children and youth: 15\% danger to self, 19\% danger to others, and 19\% were referred for danger to both themselves and others. Common provisional psychiatric diagnoses included Attention Deficit Hyperactivity Disorder (ADHD, 54\%), anxiety disorders (43\%), Disruptive Behaviour Disorder (24\%), learning and communication disorders (24\%), mood disorders (22\%), Autism Spectrum Disorder (ASD, 13\%), and Reactive Attachment Disorder (RAD, 3\%). Only 15\% of children/youth did not hold any of these selected diagnoses at the time of assessment. While 25\% of participants held one of the diagnoses listed above, complexity of psychiatric condition was evident for 60\% of the children/youth who held two or more of these. It should be noted that since this was at initial assessment diagnoses likely altered for some children/youth during their consultations/asessments with clinicians/physicians at the agencies.

Family structure. Most of the participants lived with their parent(s) (89\%). There were 57\% in households with two adults, and one quarter (25\%) in single-adult households. Other living situations included 14\% with more than two adults, 4\% not reported, and 0.1\% no adults in the home. There were 43\% of participants with parents who were married or had partners, and 27\% with separated or divorced parents. Legal guardianship was both parents for 56\%, mother only for 28\%, and father only for 4\%. Other types of guardianship included 6\% other relative or non-relative, 5\% child protection agency or public guardian, and 0.4\% youth responsible for self. Socio-economic and race-based data were not collected.

Measures

*interRAI™ Child and Youth Mental Health (ChYMH) [19] and ChYMH-Developmental Disability (ChYMH-DD) [20]. The ChYMH and ChYMH-DD are multi-source assessment instruments that are part of a comprehensive health information system inclusive of the lifespan [21]. Children and youth with neurotypical development are assessed using the ChYMH, and the ChYMH-DD is adapted for children and youth with neurodevelopmental differences. Both tools are used to assess strengths and needs for initial triaging, care planning, and to evaluate outcomes of services [22]. In the current sample, 94\% of the data came from the ChYMH and 6\% from the ChYMH-DD. The ChYMH and ChYMH-DD are completed by trained assessors using all available sources (e.g., the child/youth, caregivers, service providers, clinical records). A web-based software system is used to securely store the data and calculate results. All personal identifiers were removed before access to the data was made available for analysis. Within the ChYMH and ChYMH-DD are algorithms that trigger best practice care planning guidelines called Collaborative Action Plans (CAPs) developed in collaboration with subject matter experts [23, 24]. The current study used the triggering algorithm of the Medication Adherence CAP as the dependent variable which flags children/youth who are currently or at high risk for not taking psychotropic medication as prescribed (e.g., was adherent less than 80\% of the time, refused to take medications, and/or needed assistance with medication use but whose parent did not assist). The CAP also provides guidelines for clinicians.
to assist in improving adherence to prescribed treatment schedules. In the current sample, 2154 (21%) of young persons were flagged for nonadherence by the Medication Adherence CAP. Information on the specific kinds of psychotropic medications prescribed was not available in the dataset. The adherent and nonadherent groups were similar in psychiatric complexity as the proportion of participants with two or more of the aforementioned provisional psychiatric diagnoses flagged for nonadherence was 57%, and 61% of children/youth in the adherent group held two or more diagnoses.

**Statistical Analyses**

Preliminary chi-square analysis indicated that significantly more youth, 27% (n = 1771; ages 12–18 years), were flagged for medication nonadherence than younger children at only 10% (n = 383; ages 4–11 years) $\chi^2(1, 10,225) = 379.74, p = .000$. Therefore, the analyses considered children and youth separately.

Multiple logistic regression analyses were conducted to predict medication nonadherence for children and youth from select variables. The independent variables included the following parental/family difficulties: parental stress, feeling of being overwhelmed, hostility toward the child/youth, and lack of informal support. Parental stress was indicated using the Caregiver Distress CAP which flags high levels of parental difficulties that may be impacting the mental health of the young person (i.e., parent demonstrates two or more of the following indicators: unwilling to continue in caring activities, feelings of distress, anger, depression or other mental health issue, substance abuse or other addiction, parental conflict or custody dispute, financial difficulties, or other major life stressors in the past 3 months) [23, 24]. Individual items were used from the interRAI tools to measure feeling overwhelmed (i.e., Family feels overwhelmed by the child/youth’s condition) and hostility (i.e., Family is persistently hostile or critical of the child/youth). Trained assessors scored each item using the response options “no”, “yes”, or “not applicable” if the child/youth had no parent or family. The Informal Support CAP was used to flag families who need but lack support from informal sources such as extended family or friends to help with life challenges. Specifically, the algorithm for the Informal Support CAP identified whether the family needed but had no support in two or more of the following areas: emotional support, babysitting or respite, help in crisis situations, or help with financial problems [23].

**Results**

As shown in Table 1, results indicated that high parental stress was a significant predictor of medication nonadherence for children and youth. The items indicative of the family feeling overwhelmed (i.e., Family feels overwhelmed by the child/youth’s condition) and exhibiting hostility (i.e., Family is persistently hostile or critical of the child/youth) also predicted nonadherence for youth, but not younger children. Lastly, whether the family had support from informal sources for life challenges did not predict nonadherence in children or youth.

**Post-hoc Investigation**

The significant relation between parental stress and child/youth medication nonadherence prompted a post-hoc research question: Did those children and youth who were nonadherent to medication with stressed parents exhibit worsening psychiatric symptoms? We hypothesized that problem behaviours may increase in the absence of medication adherence, which could impact parental stress levels.

**Post-hoc Analyses**

Chi-square analyses were conducted for children and youth separately. Selecting only those nonadherent to medication, high and low parental stress as indicated by the Caregiver Distress CAP was investigated using chi-square analyses in relation to the following variable from the same dataset: Change in severity or frequency of psychiatric symptoms compared to 30 days ago, or since last assessment.
on the literature that the family in general, and parents in particular, can influence medication adherence, the current study identified a potential cycle that emphasizes the disadvantages of medication nonadherence as it interferes with therapeutic benefits and family functioning (see Fig. 2).

While the present data cannot speak to the causes of medication nonadherence in children/youth or where the cycle begins, the results are consistent with the extant literature calling for attention to parental wellbeing to support children/youth for optimal therapeutic benefits [25]. The younger a child is, the more dependent they are on parental well-being to support their therapeutic needs.
prescribed respite care may be more beneficial in managing such as peer support groups, professional consultation, and child/youth medication nonadherence. Formal supports have a positive effect on child/youth nonadherence, suggesting that implementing effective supports to manage parental stress may be beneficial to parents’ emotional wellbeing [38], possibly thereby promoting parents’ involvement in their child/youth’s medication routine.

There were 27% of participants who had separated or divorced parents. It is important for both parents in separate homes to be involved and support the child/youth’s medication schedule. Whether parents had mental health issues was included in the caregiver distress variable in the current study. There were 47% of parents in the nonadherent group to have their own developmental/mental health issues. Semahegn and colleagues reported that 49% of adults who had major psychiatric illnesses were not adherent to their own medications [17]. It may be difficult for parents who themselves struggle to adhere to a medication regimen to support children/youth who are also prescribed psychotropic medications.

**Limitations**

A limitation of the current study is the absence of socio-economic data and how this might relate to family challenges. For example, two-parent households have been found to predict better medication adherence for children and youth with anxiety [10], but whether certain socio-economic advantages or supportive family dynamics are at work in that association remains unknown. In the current study, approximately half of children/youth lived in two-adult households, but whether this translated directly into the number of parents in the home and/or socio-economic stability is unidentified in the data. A second potential limitation is that adherence was measured by subjective means of self-report rather than objective means such as pill counts or medication levels in the bloodstream. A recent meta-analysis helps to alleviate this concern as subjective and objective measures of medication adherence were found to be comparable [39]. Lastly, it is important to note that the data for this study was collected prior to the COVID-19 pandemic (up to January 2020), which represents a timeframe before unique stressors caused by pandemic-related restrictions. Pandemic
factors possibly facilitating or impeding adherence to psychotropic medication should be explored by future research, such as any impact of increased time spent within the home due to school/work/recreation closures, changes in access to mental health care from in-person to virtual appointments, family social isolation, job loss, increased financial constraints, illness, and other pandemic-related stressors for families.

**Summary**

Family dynamics have an important role in medication nonadherence in children and youth, specifically parental stress and the parent and youth relationship. The current study indicates a need to interrupt a cycle of child/youth nonadherence, worsening mental health conditions and/or behavioural symptoms, and parental stress with care planning that involves the family, attends to parental wellbeing, and empowers older youth in their own care.

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**Declarations**

**Conflict of interest** The authors have no conflict of interest to declare. Ethics clearance for secondary analyses of interRAI data gathered by other organizations was obtained from Western University (REB #106415) and all procedures have been performed in accordance with the ethical standards of Western University and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. For this type of study formal consent is not required.

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**References**

1. American Academy of Child and Adolescent Psychiatry, AACAP (2017) Psychiatric medication for children and adolescents, Part I - How medications are used. Facts for Families, No.21. https://www.aacap.org/AACAP/Families_and_Youth/Facts_for_Families/FFF-Guide/Psychiatric-Medication-For-Children-And-Adolescents-Part-I-How-Medications-Are-Used-021.aspx

2. Duncan L, Boyle MH, Abelson J, Waddell C (2018) Measuring children’s mental health in Ontario: Policy issues and prospects for change. J Can Acad Child Adolesc Psychiatry 27(2):88–98 PMCID: PMC5896522

3. Government of Canada (2006) The human face of mental health and mental illness in Canada. Minister of Public Works and Government Services Canada. ISBN 0-662-43887-6

4. Durkin LK, Bugno L, Feldman ECH, Davies WH, Greenley RN (2021) Investigating direct and indirect influences of parent personality on child medication adherence. Child Health Care 50(2):125–141. https://doi.org/10.1080/02739615.2020.1835480

5. Gilmer TP, Dolder CR, Lacro JP, Folsom DP, Lindamyer L, Garcia P et al (2004) Adherence to treatment with antipsychotic medication and health care costs among Medicaid beneficiaries with schizophrenia. Am J Psychiatry 161(4):692–699

6. Cairns R, Karanges EA, Wong A, Brown JA, Robinson J, Pearson SA et al (2019) Trends in self-poisoning and psychotropic drug use in people aged 5–19: A population-based retrospective cohort study in Australia. BMJ Open 9:e026001. https://doi.org/10.1136/bmjopen-2018-026001

7. Hazelton Foundation. Medications play a key role in treatment; 2016 [cited 2022]. Available from: https://www.bhevolution.org/public/medications.page

8. Dawood OT, Ibrahim MIM, Palaias S (2010) Medication compliance among children. World J Pediatr 6(3):200–202

9. Nagae M, Nakane H, Honda S, Ozawa H, Hanada H (2015) Factors affecting medication adherence in children receiving outpatient pharmacotherapy and parental adherence. J Child Adolesc Psychi atr N urs 28:109–117

10. Zehgeer A, Ginsburg GS, Lee P, Birmaher B, Walkup J, Kenedall PC et al (2018) Pharmacotherapy adherence for pediatric anxiety disorders: Predictors and relation to child outcomes. Child Youth Care Forum 47:633–644. https://doi.org/10.1007/s10566-018-9459-9

11. Dean AJ, Wragg J, Draper J, McDermott BM (2011) Predictors of medication adherence in children receiving psychotropic medication. J Paediatr Child Health 47:350–355

12. Zheng X, Shen L, Jiang L, Shen X, Xu Y, Yu G, Wang Y (2020) Parent and teacher training increases medication adherence for primary school children with attention-deficit/hyperactivity disorder. Front Pediatr 8. doi: https://doi.org/10.3389/fped.2020.486353

13. Charach A, Fernandez R (2013) Enhancing ADHD medication adherence: Challenges and opportunities. Can J Psychiatr Rep 15(371). https://doi.org/10.1007/s11920-013-0371-6

14. O’Brien M, Crickard E, Lee J, Holmes C (2013) Attitudes and experience of youth and their parents with psychiatric medication and relationship to self-reported adherence. Community Ment Health J 49(5):567–575

15. Miller TA, DiMatteo MR (2013) Importance of family/social support and impact on adherence to diabetic therapy. Diabetes Metab Syndro Obses 6:421–426

16. Rabinovitch C, Cassidy C, Schmitz N, Joobber R, Malla A (2013) The influence of perceived social support on medication adherence in first-episode psychosis. Can J Psychiatry 58(1):59–65. https://doi.org/10.1177/070674371305880111

17. Semahneg A, Torpey K, Manu A, Assael N, Tesfaye G, Ankomah A (2020) Psychotropic medication nonadherence and its associated factors among patients with major psychiatric disorders: A systematic review and meta-analysis. Syst Rev 9:17. https://doi.org/10.1186/s13643-020-1274-3

18. Geraghty K, McCann K, King R, Eichmann K (2011) Sharing the load: Parents and carers talk to consumer consultants at a child and youth mental health inpatient unit. Int J Ment Health Nurs 20:253–262

© Springer
19. Stewart SL, Hirdes J, Curtin-Telegdi N, Perlman C, McKnight M, MacLeod K et al (2015) InterRAI Child and Youth Mental Health (ChYMH) assessment form and User's Manual: For use with in-patient and community-based assessments, (Standard English Edition). Version 9.3. Washington, DC: interRAI. ISBN: 978-1-62255-029-6

20. Stewart SL, LaRose L, Gleason K, Nicolson R, McKnight M, Knott W et al (2015) interRAI Child and Youth Mental Health and Developmental Disability (ChYMH-DD) Assessment Form and User's Manual. Version 9.3. Washington, DC: interRAI. ISBN: 978-1-62255-044-9

21. Hirdes JP, Van Everdingen C, Ferris J, Franco MA, Fries BE, Heikkila J et al (2020) The interRAI suite of mental health assessment instruments: An integrated system for the continuum of care. Front Psychiatry 10:926. doi: https://doi.org/10.3389/fpsyt.2019.00926

22. Stewart S, Hamza C (2017) The Child and Youth Mental Health assessment (ChYMH): An examination of the psychometric properties of an integrated assessment developed for clinically referred children and youth. BMC Health Serv Res 17(82):1–10. https://doi.org/10.1186/s12913-016-1970-9

23. Stewart SL, Theall LA, Morris JN, Berg K, Björkgren M, Declercq A et al (2015) interRAI Child and Youth Mental Health Collaborative Action Plans (CAPs): For use with the Child and Youth Mental Health Assessment Instrument. Version 9.3. Washington, DC: interRAI. ISBN 978-1-62255-027-2

24. Stewart SL, Theall LA, Morris JN, Berg K, Björkgren M, Declercq A et al (2016) interRAI Child and Youth Mental Health and Developmental Disability Collaborative Action Plans (CAPs): For use with the ChYMH-DD Assessment Instrument. Version 9.3. Washington, DC: interRAI. ISBN 978-1-62255-061-6

25. Khoury JE, Kaur H, Gonzalez A (2021) Parental mental health and hostility are associated with longitudinal increases in child internalizing and externalizing problems during COVID-19. Front Psychol 12.

26. Orrell-Valente JK, Jarlsberg LG, Hill LG, Cabana MD (2008) At what age do children start taking daily asthma medicines on their own? Pediatrics 122(6):e1186–e1192

27. Both C, Mechler K, Niemeyer L, Jennen-Steinmetz C, Hohmann S, Schumm L et al (2021) Medication adherence in adolescents with psychiatric disorders. Z Kinder Jugendpsychiatrie Psychother 49(4):295–306

28. Hayes SA, Watson SL (2013) The impact of parenting stress: A meta-analysis of studies comparing the experience of parenting stress in parents of children with and without autism spectrum disorder. J Autism Dev Disord 43(3):629–642

29. O’Nions E, Happe F, Evers K, Boonen H, Noens I (2018) How do parents manage irritability, challenging behaviour, non-compliance and anxiety in children with autism spectrum disorders? A meta-synthesis. J Autism Dev Disord 48:1272–1286. https://doi.org/10.1007/s10803-017-3361-4

30. Edgecomb JB, Zima B (2018) Medication adherence among children and adolescents with severe mental illness: a systematic review and meta-analysis. J Child Adolesc Psychopharmacol 28(8):508–520. https://doi.org/10.1089/cap.2018.0040

31. Larco JP, Dunn LB, Dolder CR, Leckband SG, Jeste DV (2002) Prevalence of and risk factors for medication nonadherence in patients with schizophrenia: A comprehensive review of recent literature. J Clin Psychiatry 63:892–909

32. Ninan A, Kriter G, Steele M, Baker L, Bonifermo J, Crotogino J et al (2014) Developing a clinical framework for child/youth residential treatment. Resid Treat Child Youth 31(4):284–300. https://doi.org/10.1080/0886571X.2014.958346

33. Hamrin V, McCarthy EM, Tyson V (2010) Pediatric psychotropic medication initiation and adherence: A literature review based on social exchange theory. J Child Adolesc Psychiatr Nurs 23(3):151–172

34. McGuinness TM, Worley J (2010) Promoting adherence to psychotropic medication for youth—Part 2. J Psycho-soe Nurs Ment Health Serv 48(12):22–26. DOI: https://doi.org/10.3928/02793695-20101102-01

35. Taddeo D, Egedy M, Frappier J-Y (2008) Adherence to treatment in adolescents. Pediatr Child Health 13(1):19–24. https://doi.org/10.1093/pch/13.1.19

36. McGrady M, Ryan J, Gutiérrez-Colina A, Fredericks E, Towner M, MacLeod K et al (2015) InterRAI Child and Youth Mental Health and Developmental Disability Collaborative Action Plans (CAPs): For use with the Child and Youth Mental Health Assessment Instrument. Version 9.3. Washington, DC: interRAI. ISBN 978-1-62255-044-9

37. Goulin J-P, de Estrela C, Desmaais K, Barker ET (2016) The impact of effective pediatric adherence promotion interventions: Systematic review and meta-analysis. Child Care Health Dev 41(6):789–802. doi: https://doi.org/10.1111/cch.12271

38. Goût J-P, de Estrela C, Desmaais K, Barker ET (2016) The impact of formal and informal support on health in the context of caregiving stress. Fam Relat 65(1):191–206. https://doi.org/10.1111/fare.12183

39. Shepherd D, Goedeke S, Landon J, Meads J (2020) The types and functions of social supports used by parents caring for a child with autism spectrum disorder. J Autism Dev Disord 50:1337–1352. https://doi.org/10.1007/s10803-019-04359-5

40. Tonin FS, Wiecek E, Torres-Robles A, Pontarolo R, Benrimoj SI, Fernandez-Llamos F et al (2019) An innovative and comprehensive technique to evaluate different measures of medication adherence: The network meta-analysis. Res Soc Adm Pharm 15:358–365. https://doi.org/10.1016/j.sapharm.2018.05.010

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