SOCIAL SKILL DEFICIT PROFILES IN ADHD AND COMORBID DISORDERS

by

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B.A., The University of Texas at Austin, 2018

A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF
THE REQUIREMENTS FOR THE DEGREE OF
MASTER OF ARTS

in
THE FACULTY OF GRADUATE AND POSTDOCTORAL STUDIES
(Psychology)
THE UNIVERSITY OF BRITISH COLUMBIA
(Vancouver)
August 2022

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Social Skill Deficit Profiles in ADHD and Comorbid Disorders

submitted by Caroline Elise Miller in partial fulfilment of the requirements for

the degree of Master of Arts

in Psychology

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Abstract

Most children with attention-deficit/hyperactivity disorder (ADHD) demonstrate impairment in social functioning, especially in their social skills. However, internalizing (e.g., anxiety or depression) and externalizing (e.g., oppositional defiant disorder or conduct disorder) conditions both commonly co-occur with ADHD, and may complicate the social functioning profiles of these children. The present study sought to characterize unique social skill deficit profiles associated with the presence of internalizing comorbidity, externalizing comorbidity, and both comorbidities (internalizing + externalizing) in children with ADHD by taking a nuanced approach that considered both global social skills and specific subdomains of skills. Through pooling eight datasets from investigators across the United States and Canada, I tested these questions in a carefully phenotyped sample of $n = 1400$ children with ADHD, all of whom had parent and teacher ratings of social skills on a consistent measure. Regarding parent ratings of social skills, results indicated both significant main and interaction effects of each comorbidity on lower social skill performance in a varied pattern across global versus specific skills. For teacher ratings of social skills, externalizing comorbidity was consistently associated with poorer social skills across global and specific measures. In conclusion, social skill performance in children with ADHD does vary as a function of comorbidity status. These findings could help inform more personalized or individualized social skill interventions.
Lay Summary

Most children with attention-deficit/hyperactivity disorder (ADHD) demonstrate poorer social skills compared to their peers. However, many children are diagnosed with other disorders like internalizing (anxiety or depression) or externalizing (oppositional defiant disorder or conduct disorder) that also have social implications. In this study I aimed to determine if there were patterns of social skill impairment associated with ADHD and these common co-occurring disorders. My results show that parents and teachers notice poorer social skills across comorbidity groups, with a pattern of global and specific skill impairment. Social skill performance children with ADHD does vary as a function of comorbidity status, and this work could help inform treatment for these children in the future.
Preface

The project that was the basis of this thesis was approved by the Behavioural Research Ethics Board of the University of British Columbia (approval certificate number: H20-03862). The compilation and cleaning of datasets was completed by the author, with data collected by: Amori Yee Mikami, Sébastien Normand, Linda Pfiffner, Stephen Hinshaw, Michael Kofler, and the Multimodal Treatment of ADHD Study Team. The writing of the thesis and the data analysis was solely done by the author.
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Acknowledgements

First and foremost, I’d like to thank my advisor, Amori Yee Mikami, for her indispensable guidance and support throughout this process. I look forward to future projects under her supervision.

Next, I’d like to thank Connor Kerns and Darko Odic for serving on my committee and for providing feedback on my manuscript.

Third, I would like to thank the members of my research community who allowed me to compile their datasets to make this project possible. Thanks to Sébastien Normand, Linda Pfiffner, Stephen Hinshaw, Michael Kofler, and the researchers involved in the Multimodal Treatment of ADHD multisite study. Thanks to their respective labs and collaborators for their work in data collection as well.

Thanks to my fellow graduate students in the Peer Relationships in Childhood lab for their feedback and support. I would also like to thank the members of my cohort for their ongoing kindness and support.

Finally, I would like to thank my friends and family for their encouragement and support throughout my entire academic career.
Chapter 1: Introduction

Attention-deficit/hyperactivity disorder (ADHD) is a chronic neurodevelopmental condition that affects approximately 5% of school-age children worldwide (Polanczyk et al., 2007, 2014). It is characterized by significant impairment related to developmentally inappropriate levels of inattention and/or hyperactivity/impulsivity. Those with ADHD are classified into the inattentive presentation (predominantly inattentive symptoms), the hyperactive/impulsive presentation (predominantly hyperactive/impulsive symptoms), or the combined presentation (both types of symptoms). Many children with ADHD experience social impairments as a functional outcome of their disorder (Hoza et al., 2005; Huang-Pollock et al., 2009; Feldman et al., 2017), such as poor social skills (the necessary behaviors to be successful in social situations; Gresham et al., 2001). Social skill problems are persistent, lasting well into adolescence and adulthood (Bagwell et al., 2001; Friedman et al., 2003), and portend difficulties such as experiencing peer victimization (Zendarski et al., 2020), poor academic performance (Dvorsky & Langberg, 2016), emotion dysregulation (Bunford et al., 2015), and negative self-esteem (Harpin et al., 2016).

ADHD rarely occurs in isolation, with most children having at least one other condition (Reale et al., 2017; Larson et al., 2011), such as oppositional defiant disorder (ODD), conduct disorder (CD), depression, or anxiety disorders. That is, the minority of children with ADHD have ADHD alone. Comorbidities can alter the clinical presentation, symptom severity, and functional outcomes associated with ADHD (Bélanger et al., 2018). Given the clinical relevance of comorbid disorders, the current study aimed to characterize the social skills profiles of children with ADHD and various patterns of comorbidity. I took a nuanced view of both social skills and the ways that comorbidities may combine to create unique patterns of impairment.
Social Skills in ADHD

Social skills, defined as the behaviors required to perform successfully or competently in social situations (Gresham et al., 2001), include actions like taking turns, giving compliments, or starting a conversation with a peer. The focus of social skills is on in-the-moment building-block behaviors of basic social interaction, and are distinguished from presumed outcomes of displaying social skills (such as good social relationships, peer acceptance, or friendship). Like any other skills, social skills must be taught, learned, and practiced in order to be used successfully (Gresham et al., 2001). Importantly, social skills represent a constellation of individual skills that can each be acquired and mastered, as opposed to a global construct where a child either does or does not have social skills (Gentschel & McLaughlin, 2000). For example, a child may have mastered the skill of empathy, yet may struggle with self-control and cooperation, illustrating that, as social skills can be individually learned, different children will have unique patterns of acquired skills. Further, an average global score may be comprised of some exceptional and some impaired individual skills, and in such a case, the global score would not adequately communicate the child’s social profile.

Children with ADHD demonstrate poor global social skills relative to their peers, as well as deficits in specific individual skills (Van der Oord et al., 2005). For example, the individual social skill of communication, which consists of effective communicative behaviors like making eye contact and saying please and thank you, has been demonstrated to be impaired for children with ADHD (Landau & Milich, 1988). Cooperation includes behaviors such as sharing, helping others, and following rules, has been consistently found to be an area of concern for children with ADHD (Wehmeier et al., 2010; DuPaul et al., 2001; Antshel & Remer, 2003; Van der Oord et al., 2005). Assertion, which consists of asking for help, initiating conversations appropriately,
and introducing oneself, has similarly been shown to be impaired for this population (Solanto et al., 2009; Antshel & Remer, 2003; Van der Oord et al., 2005). Next, these children demonstrate deficits in self-control, which captures responding well to conflict, as well as turn taking and compromise (Solanto et al., 2009; Van der Oord et al., 2005; Unnever & Cornell, 2003).

Responsibility, which refers to effective communication with adults, is yet another specific social skill consistently shown to be a deficit for children with ADHD (Antshel & Remer, 2003; Van der Oord et al., 2005). Engagement refers to how easily a child joins others at play or makes friends, and has been shown to be impaired for children with ADHD (Marton et al., 2015).

Lastly, empathy, or concern for others’ emotions and perspective-taking, is also impaired for these children (Marton et al., 2009; Van der Oord et al., 2005).

Interestingly, some intervention literature lends credence to the idea of distinguishing between poor social skills generally (or on average) and patterns of individual social skill deficits in children with ADHD. Despite the well-documented deficits in global social skills in ADHD populations, social skills training (SST; at least how it is traditionally delivered in clinic settings) has been largely ineffective, with multiple reviews and meta-analyses concluding that SST is not superior to no intervention, regardless of study methodology or participant characteristics (de Boo & Prins, 2007; Evans et al., 2018; Evans et al., 2014; Mikami et al., 2017). It has been theorized that this may be due to a target mismatch, whereby SST focuses on acquiring knowledge, but children with ADHD demonstrate impairment in skill performance instead (Mikami et al., 2017; Aduen et al., 2017). That is, they know the social skill, but they implement the skill either inconsistently or incorrectly.

However, whereas global social skills (i.e., in general, representing the average of different areas of skills) may not increase as a result of treatment, children with ADHD may be
more likely to demonstrate improvements on specific social skills instead (e.g., assertion, cooperation, or empathy; Antshel & Remer, 2003; Daley et al., 2014; de Boo & Prins, 2007). By combining specific social skills into a global score reflecting the average of all skills, potential treatment-related improvements in specific skills may be obscured. Taken together, this literature suggests that individual children may have an uneven pattern of social skills deficits (e.g., showing stronger skills in some areas but weaker skills in others), and that such nuances are important when characterizing and treating social skill impairments in children with ADHD.

The role of the informant may also be important in understanding variability in social skills profiles. For elementary school-age children with ADHD, it is common to seek reports from parents and teachers about their behaviors. However, parents and teachers do not necessarily have strong agreement about a child’s social skills. For example, the correlation between parent- and teacher-reported social skills on the Social Skills Improvement System (SSIS) was .30 in a sample of typically developing children and adolescents (Gresham et al., 2010). Parents tended to give higher ratings than teachers in this typically developing sample, indicating that the context of the behavior may be important when rating (Gresham et al., 2010). Discrepant reports between parents and teachers could be attributable to various sources, such as the child showing legitimately different social skills in each environment (home versus school) as suggested by Gresham et al. (2010), or to informant biases when observing the same child behavior. Nonetheless, it is possible that children with ADHD may have better agreement between parents and teachers about their social skills, relative to typically developing children, because those with ADHD were required to have both parents and teachers perceive ADHD symptoms and impairments in order to be diagnosed with the disorder (Becker et al., 2012b). Relevant to the current study, the effects of comorbidities on social skill profiles may vary based
on informant, as described in greater detail below (see Becker et al., 2012b).

In summary, social skills deficits in children with ADHD relative to their peers are prevalent and research from the intervention literature underscores potential heterogeneity in specific social skills profiles in this population. That is, one child with ADHD may have mastered certain social skills yet not others, and this pattern may be unique from that in another child with ADHD. Meta-analytic evidence has found that considering comorbidity, informant, and using gold-standard diagnostic procedures are important when measuring social skills in this population (Ros & Graziano, 2018). The current study attempted to better understand and explain this heterogeneity by considering a clinically-important and prominent feature for children with ADHD: their comorbid disorders.

**Common Comorbidities with ADHD**

In community samples, ADHD rarely occurs alone (Larson et al., 2011; Reale et al., 2017). Approximately one-third of children with ADHD have one additional disorder, and another third have either two or three comorbidities (Larson et al., 2011).

Internalizing disorders (anxiety or depression) are comorbid in children with ADHD at rates of 25-49% (Spencer et al., 2007; Schatz & Rostain, 2006). The risk for a child with ADHD to develop an internalizing disorder increases with age (Gordon-Lipkin et al., 2018; Spencer et al., 2007), perhaps due to the average age of onset for anxiety and depressive disorders being later than that for ADHD, or the negative functional sequelae associated with ADHD impairment (e.g., increased peer conflict, fewer friendships, poor academic performance; Steinberg & Drabick, 2015). Having a comorbid internalizing disorder confers additional risk for poor academic outcomes (Booster et al., 2015; Cuffe et al., 2020), sleep difficulties (Mayes et al., 2009), and impairment in overall quality of life (Armstrong et al., 2015).
Externalizing disorders, like ODD and CD, co-occur with ADHD at rates of 30-50% (Spencer et al., 2007). Similar to internalizing disorders, the presence of a comorbid ODD or CD diagnosis confers additional risk in a variety of areas. The combination of ADHD and an externalizing disorder has been linked to increased future delinquency (Sibley et al., 2011), risk-taking (Humphreys & Lee, 2011), aggression (Abikoff et al., 2002; Frankel & Feinberg, 2002), and poorer overall quality of life (Armstrong et al., 2015).

Furthermore, up to 22% of children with ADHD have a comorbid internalizing and externalizing disorder (e.g., two comorbidities, one of each nature; Abikoff et al., 2002). Some research suggests that children with both types of comorbidities are at greater risk for overall poorer functioning – peer relationships, general quality of life, family conflict, and daily functioning (Armstrong et al., 2015) – relative to children with ADHD alone. Overall, however, despite their prevalence, the least is known about this group of children.

**Pattern of Social Skills Deficits Associated with Comorbidities**

The pattern of social skill deficits associated with ADHD may potentially differ depending on associated comorbidities, specifically internalizing only, externalizing only, or both internalizing and externalizing disorders. To my knowledge, no study to date has investigated this question in a systematic way using an adequately powered design, and considering nuanced patterns in specific social skills deficits (as opposed to social skills in general or on average). Both internalizing and externalizing disorders are linked to poor social functioning and manifest in interpersonal contexts (Bornstein et al., 2010), however the nature of this manifestation may vary.

**Internalizing Comorbidity**

Comorbid internalizing disorders in children with ADHD may theoretically relate to
social skills in several ways. First, given that internalizing disorders (without ADHD) tend to be associated with poorer social skills (Hammen & Shih, 2014; Higa-McMillan et al., 2016), one might expect the addition of an internalizing comorbidity would confer additional impairment in social skills, relative to ADHD without internalizing comorbidity. For example, internalizing disorders could lead to socially withdrawn behaviors which are not typically associated with ADHD alone (Rubin et al., 2009), leading to incrementally poorer social skills which one might expect to see in specific domains such as assertion. Alternatively, some researchers have speculated that comorbid internalizing disorders might dampen the tendency for impulsivity in some children with ADHD (Schatz & Rostain, 2006; Snyder, 2013), which could lead to better social skills. If so, one might expect to see this specifically in areas such as self-control, but not necessarily in measures of global social skills. However, a third idea is that children with ADHD and an internalizing disorder are more socially inconsistent than those with ADHD and no internalizing disorder. The inappropriate, disruptive social behaviors associated with ADHD, when combined with an over-inhibited temperament associated with internalizing disorders, could lead to hard-to-read or inconsistent social skill performance.

Research evidence for the contribution of comorbid internalizing disorders to social skills in ADHD has been mixed, however. This may be attributable to the tendency for studies to examine global social skills, as opposed to considering that different patterns may exist across specific, individual skills. In some studies, even after controlling for other variables like ODD symptoms, children with ADHD and comorbid anxiety demonstrate poorer social skills than children with ADHD and no anxiety (Bishop et al., 2019; Mikami et al., 2011), but this has not been found in other work (Lee et al., 2012). Meta-analytic evidence demonstrates that, for children with ADHD, the addition of an internalizing diagnosis may either have no impact or an
exacerbating effect on social skill deficits (Becker et al., 2012b), indicating the need for future work to parse apart the specific patterns of impairment.

I wonder if the effects of comorbid internalizing disorders on social skills may be more evident if examining individual social skills instead of global social skills measures. Feldman and colleagues (2017) found that, for children with ADHD, future depressive symptoms were mediated by impairment in specific social skills (cooperation, assertion, responsibility, and self-control). It is also possible that the magnitude of the effect of comorbid internalizing disorders on social skills deficits may be influenced by the informant source. Becker et al. (2015) found that children with ADHD and internalizing comorbidity, compared to those with ADHD but no internalizing comorbidity, had poorer parent- but not teacher- or child-reported social skills, although results varied somewhat depending on who reported the internalizing comorbidity. Meanwhile, Jensen et al. (2001) reported that social skills among children with ADHD and internalizing comorbidity, relative to ADHD and no internalizing comorbidity, were impaired according to parent, but not teacher, reports. Feldman et al. (2017) found that the specific social skills endorsed as impaired for children with ADHD and internalizing comorbidity varied based on informant, as well.

**Externalizing Comorbidity**

There are also several reasons why externalizing comorbidities would affect social skills in children with ADHD. Externalizing behaviors are often, by nature, socially inappropriate because they are breaking norms or rules (Shaw & Giliom, 2000). For example, social situations may elicit reactions of argumentativeness, poor sportsmanship, aggression, and rule-breaking in children with externalizing disorders. These sorts of social skills deficits are challenging for both adults and peers in the child’s life, leading to strained social relationships (Bornstein et al.,
2010). Similar to as with internalizing disorders, however, perhaps certain social skills are more implicated than others. Aggression can clearly be linked to ODD and CD (Waschbusch et al., 2002), and other social skill domains like self-control are likely to relate to impulsive externalizing symptoms.

Some research has found that the co-occurrence of externalizing disorders and ADHD is associated with poorer global social skills in general, compared to ADHD without externalizing comorbidity (Booster et al., 2012; Graziano et al., 2011). On the other hand, meta-analytic findings underscore inconsistency in this literature, with some studies finding that a comorbid externalizing disorder has no effects whereas others find that it exacerbates ADHD-related social skill impairment (Becker et al., 2012a). Relative to the literature on internalizing comorbidities, there has been more research regarding deficits in specific social skills associated with externalizing comorbidities. For example, research has implicated poor self-control and low emotional awareness in children with ADHD and comorbid externalizing disorders (Rosen et al., 2014; Factor et al., 2016). Socially difficult or undesirable behaviors like rule-breaking and aggression are higher in children with ADHD and comorbid externalizing compared to ADHD and no externalizing comorbidity (Abikoff et al., 2002).

Similar to as with internalizing disorders, I wonder if the deficits associated with externalizing comorbidities may differ depending on the specific social skill. Responsibility and self-control may be most likely to be affected by the addition of comorbid externalizing problems, because of the nature of externalizing disorders. The informant may also matter; when parents rate social impairment in their children with ADHD and externalizing comorbidity, an exacerbating effect is almost always found (see Becker et al., 2012b). Teacher report evidence has been more inconsistent, and most studies that contain both parent and teacher informants
unfortunately combine the reports into one composite score and/or have low sample sizes (Becker et al., 2012b). In sum, evidence seems to support an exacerbating effect of a comorbid externalizing disorder on social competence, however parent and teacher report should be parsed apart to consider the effect on specific social skills as opposed to on social skills on average.

**Internalizing + Externalizing Comorbidity**

It is largely accepted that any additional comorbidity alongside ADHD will likely both increase the risk for social problems and not provide any attenuation of social impairment (e.g., Jensen et al., 1997), although admittedly this has been better established for externalizing relative to internalizing comorbidities. However, the expected pattern of social skills among children with both internalizing and externalizing comorbidities has rarely been tested.

There are multiple ways in which the combination of internalizing and externalizing disorders could manifest in social skills impairment in ADHD. As one example, the relationship could be additive, such that externalizing and internalizing related deficits may sum together to result in incrementally poorer social skills. As another example, the relationship might be interactive. Here, one possibility is that externalizing related problems, which may be more overt and socially inappropriate, may overshadow the effects of the internalizing disorder. This kind of interaction would be evidenced by children with ADHD and an externalizing disorder performing similarly to those with ADHD and both comorbidities. Alternatively, an interactive effect could manifest as exponentially worse social skills impairment among children with both internalizing and externalizing comorbidities, exceeding the simple sum of the impairment associated with one comorbidity or the other. This might happen, for instance, because children with only one comorbidity are more likely to have a way to compensate for that comorbidity, which is not afforded to those with both comorbidities.
To date, studies investigating social skills in the group of children with ADHD and both internalizing and externalizing comorbidities have yielded mixed results. Booster et al. (2012) found that an externalizing comorbidity contributed to poorer global social skills, with the presence of an additional internalizing disorder not significantly impacting the expression of social skills. This might suggest that the impact of externalizing disorders overshadows the social impairment uniquely associated with internalizing pathology. In other words, there is evidence that the relationship is interactive in nature, with externalizing-related deficits overwhelming internalizing. Conversely, other research has pointed to the importance of internalizing disorders; Newcorn et al. (2004) demonstrated that adolescent social problems were best predicted by ADHD, CD, and an anxiety diagnosis. Here, evidence points to unique contributions of both externalizing and internalizing psychopathology impacting social functioning within ADHD. Further, there is evidence that internalizing disorders only contribute to social impairment when an externalizing disorder is also present (Booster et al., 2012; March et al., 2000). This indicates that there may be interactive effects of having both comorbidities such that social skill performance is exponentially worse. Other studies have found that, even when controlling for externalizing disorders, internalizing symptoms impair overall social skills in children with ADHD (Mikami et al., 2011). Importantly, Morgan et al. (2020) found that children’s response to a social skills training intervention was moderated by symptoms of externalizing behaviors, depression, and anxiety. This suggests that each domain of comorbidity (internalizing versus externalizing) has important unique contributions to treatment effects, perhaps due to varied patterns of social skill deficits.

There are several possible reasons why existing studies attempting to disentangle the additive or interactive effects of comorbidities on social skill functioning in ADHD may have
found mixed results (Becker et al., 2012b). One explanation is that studies considering the group of children with ADHD and both comorbidities tend to focus, for the most part, on global social skills (the average of all skills, or social skills in general) as opposed to individual, specific skills (Jensen et al., 2001). Children with internalizing relative to externalizing comorbidities may have different patterns of specific skill impairment, and this may play out in different interaction effects depending on the specific social skill outcome. This would be evidenced by externalizing impairment overshadowing internalizing for some specific skills, while impairments from both comorbidities contributing to performance deficits for other skills.

Second, most studies considering each comorbidity group separately use the SSIS (Lee et al., 2012; Feldman et al., 2017; Rosen et al., 2013), which is a specialized rating scale designed to assess social skills. By contrast, work looking at children with both externalizing and internalizing comorbidities has varied in its measurement approaches. For example, Booster et al. (2012), when investigating the impact of comorbidity status on functional impairment in ADHD, used the social skills subscale from a larger broadband measure, the Behavior Assessment System for Children (BASC; Reynolds & Kamphaus, 2015). This is in comparison with the SSIS (Gresham & Elliot, 2007), which allows for measurement of both global social skills and of specific individual social skills, including communication, cooperation, assertion, responsibility, empathy, engagement, and self-control. Further, the SSIS allows for both parent and teacher reporting, and its use among ADHD samples has been validated (Van der Oord et al., 2005; Gresham & Elliot, 2007; Gresham et al., 2010). Specificity in measurement, referring both to the assessment tool and the individual social skills, may offer clearer evidence on the nature of impairment in this internalizing + externalizing comorbidity group.

Finally, differences in informant or sample characterization may lead to mixed results in
the literature. Becker et al. (2012b) note the importance of attending to informant differences (e.g., parent versus teacher) and sample characterization (e.g., using diagnostic groups versus internalizing/externalizing symptoms on a spectrum) in future work, as studies investigating the ADHD comorbid groups has used a combination of the above variables. Notably, because of the challenges in recruiting clinical participants, many studies have low sample sizes for addressing these questions, particularly when considering the group of children with ADHD + both internalizing and externalizing comorbidity.

**Current Study**

Using a large and well-characterized sample of children with ADHD and comorbidities, the first aim was to identify patterns of social skill deficits associated with ADHD plus the presence of: internalizing comorbidity, externalizing comorbidity, and internalizing + externalizing comorbidity, relative to having ADHD and no such comorbidity. Parsing apart the additive or interactive effects of both comorbidities was a factor of particular interest. I hypothesized that the presence of any comorbidity pattern would be associated with poorer social skills in general or on average, compared to children with ADHD and no comorbidity. Further, I expected that externalizing comorbidity would be associated with poorer social skills than internalizing comorbidity. When both internalizing and externalizing comorbidities are present, I hypothesized that there would be an interactive effect, leading to exponentially worse social skills compared to the sum of the problems associated with internalizing comorbidity plus those associated with externalizing comorbidity.

The second aim was to identify subscale-specific patterns of strengths and weaknesses associated with each comorbidity. That is, I sought to look beyond the global social skills score to examine which individual social skills may or may not be impaired. Here, I hypothesized
different patterns of impairment associated with internalizing relative to externalizing comorbidity. For internalizing disorders, I expected that assertion, communication, and engagement would be impaired, and for externalizing, that self-control, responsibility, and cooperation would be impaired. When both comorbidities are present, I hypothesized that each individual social skill deficit associated with either internalizing or externalizing alone will be impaired, and the relationship would be interactive, leading to greater impairment than the sum of the individual comorbidities.

The current study sought to address measurement and classification issues in the literature as well. I utilized both parent and teacher ratings to look at social skills across contexts and informants. Study findings could provide clarity on the specific nature of social skill deficits in ADHD based on comorbidity, with the eventual goal of informing personalized interventions.
Chapter 2: Method

Participants

The current study is a secondary data analysis of data collected from various sites across the United States and Canada. Eight existing datasets from four research groups were compiled to create a deidentified sample comprising 1400 children aged 7-12 with clinical diagnoses of ADHD. Comorbidity status of ODD, CD, anxiety, and/or depression were not exclusionary for any dataset. Participants were recruited through a variety of means, including through schools, hospitals, the community, and self-referrals. Each original study’s consent procedure included participants’ consent to use their data in future studies, and datasets were obtained with university ethics review board approval and data use agreements. Datasets were obtained from the University of British Columbia (UBC), the Université du Québec en Outaouais (UQO), and the University of Virginia (UVA) reflecting Research Group 1; the University of California at San Francisco (UCSF) and the University of California at Berkeley (UCB) reflecting Research Group 2; Florida State University (FSU) reflecting Research Group 3; and the Multimodal Treatment for ADHD Collaborative Group (MTA) which was conducted at eight sites across the United States and Canada, reflecting Research Group 4. Table 1 provides demographic and diagnostic summaries for each dataset.

Power Analysis

A power analysis was conducted using GPower v3.1 (Faul et al., 2007) to determine the sensitivity for detecting effects. In Jensen and colleagues’ (2001) analysis of ADHD comorbidity status and global social skills, parent and teacher effect sizes ranged from $f = .07$ to $.55$ between children with ADHD + comorbidities relative to those with ADHD alone. To detect small effects ($f = .10$) with power $= .95$, $\alpha = .05$ and with four groups (ADHD + internalizing, ADHD +
externalizing, ADHD + both comorbidities, ADHD without these comorbidities) the required sample size is \( N = 1302 \). Thus, this study \( (N = 1400) \) is sufficiently powered.

**Measures**

**Global and Specific Social Skills**

Each dataset contains both parent and teacher report on either the SSIS (Gresham & Elliot, 2008) or its predecessor, the Social Skills Rating System (SSRS; Gresham & Elliot, 1990). Both the SSIS and the SSRS assess social skills globally (i.e., generates a global score) and pertaining to specific skills (i.e., generates subscale scores). Both versions of the scale demonstrate good internal and divergent validity, and there was high convergent validity on both parent and teacher forms, and global and subscale scores, between the SSRS and SSIS (see Gresham et al., 2011).

The SSIS includes 46 parent items and 30 teacher items to assess child social skills. The frequency with which the child exhibits each item is rated on a 4-point scale (never, seldom, often, almost always) and the importance of each item is rated on a 3-point scale (not important, important, critical). In the standard scoring system, the frequency items are summed to generate a total raw score reflecting a global score of social skills, which is converted to a standard score \( (M = 100, SD = 15) \) based on age and sex norms. In addition, the SSIS generates seven subscales of specific social skills (communication, cooperation, assertion, responsibility, empathy, engagement, and self-control), although these are raw scores and not standardized. In the norming sample \( (N = 4700) \), the 6–8-week test-retest reliability was .82–.86 and the internal consistency was \( \alpha = .95–.97 \). There are additional items to assess problem behaviors on the SSIS, but these are not considered in the current study, which focuses on social skills.

The SSRS consists of 39 parent and 30 teacher items to assess child social skills. Similar
to the SSIS, items are rated on a 3-point scale for frequency (*never, sometimes, very often*) and a 3-point scale for importance (*not important, important, critical*). There is a global score of total social skills, reflecting the sum of all the frequency items, converted to a standard score based on age and sex norms. There are also four subscales of specific social skills (cooperation, assertion, responsibility, self-control), which, like the SSIS, are raw scores and not standardized. In the norming sample (*N* = 4000), the 6-week test-retest reliability was .90 and the internal consistency was $\alpha = .87--.94$. As with the SSIS, the SSRS also contains items assessing problem behaviors, which are not considered in the current study.

**Data Reduction**

Due to small differences in the subscale items between the SSIS and SSRS, subscale raw scores were converted to proportion scores. Each raw score was turned into a percentage based on how many points out of the possible maximum were endorsed. These proportion scores allow for direct comparison between the SSIS and SSRS subscales. Both the SSIS and SSRS yield standardized scores for the total social skills score, so comparisons were not an issue.

All datasets contained both parent and teacher reports of social skills (on either the SSIS or the SSRS). I considered whether a composite score reflecting parent and teacher ratings could be created, but this was not supported based on bivariate correlations (see Results). Therefore, separate parent and teacher ratings were retained.

**Procedures**

**Dataset Selection**

The inclusion criteria for datasets to be used in the current study were: (a) well-characterized sample of school-aged children clinically diagnosed with ADHD, (b) parent and teacher ADHD rating scale data, (c) parent and teacher SSIS or SSRS global and subscale scores,
and (d) comorbidity diagnostic status variables. Datasets were obtained through a variety of means. For example, a request was made through the Association for Behavioral and Cognitive Therapies ADHD Special Interest Group listserv for datasets matching the inclusion criteria, previous collaborators were contacted directly, and a formal data request was made through the National Institute of Mental Health (NIMH) to access the MTA Collaborative Group dataset.

All datasets included only de-identified data, and the UBC Behavioral Research Ethics Board approved each data transfer. For datasets not owned by UBC researchers, data use agreements were created collaboratively with each data collection site.

**Diagnostic Procedure**

All children in all datasets had a validated ADHD diagnosis based on the current DSM criteria (i.e., DSM-IV, DSM-IV-TR or DSM-V) when the data were collected. Note that for children, the diagnostic criteria for ADHD are nearly identical across the three editions of the DSM, with the one exception being that in DSM-V, symptoms can have a later onset (up to age 12) whereas they must present by age 6 in the earlier versions. Each site’s procedure to establish an ADHD diagnosis was slightly different, and Table 2 includes the diagnostic procedures and measures used at each site. However, there were overarching similarities between each procedure that provide rationale for combining datasets. Specifically, to diagnose ADHD, each research group used a well-validated parent and teacher report rating scale of inattention and hyperactivity/impulsivity modeled after the DSM criteria for ADHD (e.g., ADHD-RS-5, CSI-4, SNAP; DuPaul et al., 2016; Gadow & Sprafkin, 2002; Swanson, 1981). Each study required parent and teacher elevations or considered the highest endorsements on an item (“or” rule, judging a symptom as above threshold if parent or teacher endorsed). After meeting clinically significant cutoffs for ADHD symptoms on rating scales, each participant’s parent or guardian
then completed a diagnostic interview (e.g., KSADS, DISC; Axelson et al., 2009; Shaffer et al., 1996). These interviews all include questions that map onto the DSM criteria for ADHD, and include sections with similar diagnostic questions for other childhood disorders of anxiety, depression, ODD, and CD. One dataset from Research Group 2 (UCSF-B, see Table 2) relied solely on parent and teacher questionnaire endorsements and participants did not complete a clinical interview. In sum, each site used best-practice ADHD diagnostic procedures of equivalent rigor, including parent and teacher ratings of symptoms and (in all but one dataset) parent clinical interview.

**Comorbidity Criteria**

Similar procedures were used by each site to diagnose comorbidity in their respective samples, as shown in Table 2. No sites excluded participants based on comorbid status, and symptoms of anxiety, depression, ODD, and CD were obtained for each participant. Every research group, at minimum, required parent clinical interview endorsements that met the DSM diagnostic thresholds for the comorbid disorder. Most studies also required evidence from another source, either child report or interview measures, or teacher endorsements on additional forms. The same dataset from Research Group 2 (UCSF-B), however, made these diagnoses based on parent and teacher rating scales (no clinical interview). Overall, comorbid diagnoses were made using best estimates and consensus diagnostic practices and each data collection site’s procedures were comparable.

Upon receiving datasets, summary dummy-coded variables were generated to indicate comorbid status. An internalizing dichotomous variable (0 = not present, 1 = anxiety and/or depression present) as well as an externalizing dichotomous variable (0 = not present, 1 = ODD and/or CD present) were created.
Data Analytic Plan

Preliminary analyses were run using SPSS. Crosstab descriptive statistics were conducted to describe the sample in terms of group membership in: ADHD + internalizing, ADHD + externalizing, ADHD + both comorbidities, and ADHD without either comorbidity. For example, a child would be in the ADHD + both comorbidities group if they had scores of 1 for both dummy-coded variables, or in the ADHD without either comorbidity group with both 0s. Descriptive statistics were presented for the four comorbidity groups on both global and specific social skill performance. In addition, demographic variables of age and gender were examined to see if they significantly differed among the four comorbidity groups; if so, these demographic variables were included as covariates in the main analyses.

The central analyses to assess the relationship between comorbidity status and parent- or teacher-rated social skills were run using R Studio. Participants were nested within Research Group in all analyses, so as to account for potential differences between data collection sites. The nested model was a significantly better fit than a complex model for both parent ($p < 0.005$) and teacher ($p < 0.005$) rated social skills; therefore each model was run including Research Group as a nested variable. For each social skill outcome variable, a model was conducted for parent-rated social skills and then repeated for teacher-rated social skills.

To test group differences in the outcome variable of the global social skills total score, an ANCOVA was run with two dichotomous predictors: presence of an internalizing comorbidity (0 = not present, 1 = present) and presence of an externalizing comorbidity (0 = not present, 1 = present). Any demographic covariates found to be significant in the previous analyses were included. The main effect of each predictor was examined to determine the incremental effects of having an internalizing or externalizing comorbidity on social skill performance, relative to
having ADHD without such a comorbidity. Finally, the interaction effect between the presence of internalizing and externalizing comorbidities was examined.

Similarly, I conducted ANCOVAs with the outcome variables of each social skills subscale (communication, cooperation, assertion, responsibility, empathy, engagement, and self-control), with relevant covariates that were significant in initial analyses. The same two predictors of presence of internalizing comorbidity and presence of externalizing comorbidity were included in the model. Main effects of each comorbidity status as well as interactive effects for the combination of internalizing plus externalizing comorbidities were analyzed.
Chapter 3: Results

Descriptive Statistics

Sample means, standard deviations, skew, and kurtosis for the variables of global social skills, and specific subdomains, can be found in Table 3. Overall, there was no significant skew in any variables, indicating a symmetrical dataset. Similarly, kurtosis for each variable was within normal limits, suggesting that the distribution of this dataset is normal. For each diagnostic group, global social skill means were lower than the SSIS and SSRS norming samples ($M = 100; SD = 15$), which indicates poorer social skills. Children diagnosed with ADHD alone (Parent $M = 85.69, SD = 14.06$; Teacher $M = 83.94, SD = 21.94$), an additional internalizing disorder (Parent $M = 85.78, SD = 14.10$; Teacher $M = 83.82, SD = 13.23$), an additional externalizing disorder (Parent $M = 78.01, SD = 12.39$; Teacher $M = 78.75, SD = 10.76$), and two comorbidities (Parent $M = 78.04, SD = 13.97$; Teacher $M = 78.00, SD = 12.00$) each had lower global social skills compared to the mean of the norming sample.

Bivariate correlations between study variables are displayed in Table 4. Notably, the correlation between parent and teacher ratings were low for global social skills, $r = 0.24$. The correlations between parent and teacher ratings were similar for the subdomains of communication ($r = 0.24$), cooperation ($r = 0.17$), assertion ($r = 0.15$), responsibility ($r = 0.26$), empathy ($r = 0.29$), engagement ($r = 0.37$), and self-control ($r = 0.27$). Based on the overall pattern of low correlations between parents and teachers, it was decided to run separate models for the outcome variables of parent-reported and teacher-reported social skills.

Global Social Skill Performance

All ANCOVA results can be found in Table 5.
**Parent Ratings**

Parents rated global social skills as more impaired for children with an internalizing comorbidity \((F_{1,1365} = 9.181, p < .0005)\) as well as for children with an externalizing comorbidity \((F_{1,1365} = 63.580, p < .0001)\). The interaction between internalizing and externalizing comorbidity status was also significant \((F_{1,1365} = 9.582, p < .0005)\), such that children with dual comorbidities performed similarly to those with externalizing alone. Graphs of each significant interaction effect across all models can be found in Figure 1. Additionally, gender was a significant covariate in this model \((F_{1,1365} = 13.916, p < .0001)\).

**Teacher Ratings**

Teachers rated children with an externalizing comorbidity as having poorer global social skills \((F_{1,1327} = 60.828, p < .0001)\), with both age \((F_{1,1327} = 10.779, p < .0005)\) and gender \((F_{1,1327} = 14.113, p < .0005)\) as significant covariates. The teacher-reported associations with internalizing comorbidity and interaction effect were nonsignificant \((F_{1,1327} = 0.037, p = 0.847, F_{1,1327} = 0.289, p = 0.591)\).

**Subscale Specific Social Skill Performance**

These ANCOVA results are also in Table 5.

**Parent Ratings**

**Communication.** Parents rated communication as more impaired in children with an externalizing disorder \((F_{1,650} = 17.871, p < .0001)\), while all other associations and interactions were nonsignificant \((F_{1,650} = 0.907-17.871, p = 0.057-0.341)\).

**Cooperation.** Similarly, there was a significant main effect where children with an externalizing comorbidity were rated as having poorer cooperation skills \((F_{1,1377} = 75.922, p < .0001)\), while neither the main effect of internalizing comorbidity \((F_{1,1377} = 0.733, p = 0.392)\), or
the interaction between externalizing and internalizing comorbidity ($F_{1,1377} = 3.515, p = 0.061$), was significant.

**Assertion.** Conversely, for assertion, there was a significant main effect of internalizing comorbidity, such that children with this diagnosis demonstrated poorer assertion ($F_{1,1377} = 7.183, p = 0.007$). No other variables were significant, either as a main effect or interaction effect ($F_{1,1377} = 0.394-1.202, p = 0.273-0.530$).

**Responsibility.** Next, the parent model showed significant main effects of internalizing comorbidity ($F_{1,1376} = 5.340, p = 0.021$), as well as externalizing comorbidity ($F_{1,1376} = 27.543, p < .0001$), as associated with poorer responsibility. Additionally, the interaction was significant ($F_{1,1376} = 4.215, p = 0.040$), such that children with both comorbidities performed similarly to those with externalizing comorbidity alone (see Figure 1).

**Empathy.** Parents rated empathy as impaired in children with an externalizing comorbidity ($F_{1,650} = 17.867, p < .0001$). The interaction effect was also significant ($F_{1,650} = 5.052, p = 0.025$), where children with an externalizing comorbidity alone performed worse than those with both externalizing and internalizing comorbidities (see Figure 1). That is, the negative association between externalizing comorbidity with the social skill of empathy was buffered by the addition of an internalizing comorbidity.

**Engagement.** No significant covariates ($F_{1,650} = 0.009-0.038, p = 0.846-0.926$), main effects of internalizing or externalizing comorbidity ($F_{1,650} = 0.022-2.098, p = 0.148-0.882$), or the interaction effect between the two comorbidities ($F_{1,650} = 0.808, p = 0.369$), were present for the outcome variable of engagement.

**Self-Control.** Finally, the parent model demonstrated significant main effects of both internalizing ($F_{1,1376} = 7.528, p = 0.006$) and externalizing ($F_{1,1376} = 117.353, p < .0001$)
comorbidities being associated with poorer self-control. The interaction effect was also significant \( (F_{1,1376} = 5.148, p = 0.023) \), such that children with both comorbidities performed similarly to those with an externalizing comorbidity alone (see Figure 1).

**Teacher Ratings**

**Communication.** In the teacher data, there was a significant main effect of externalizing comorbidity as associated with poorer communication skills \( (F_{1,648} = 23.182, p < 0.001) \). Internalizing and the interaction were nonsignificant in the model \( (F_{1,648} = 0.061-0.099, p = 0.753-0.805) \).

**Cooperation.** Similarly, teachers rated cooperation as poorer in children with an externalizing comorbidity \( (F_{1,1375} = 16.871, p < .0001) \). No other main effects or interactions were significant \( (F_{1,1375} = 0.090-2.036, p = 0.154-0.764) \).

**Assertion.** Next, the teacher model demonstrated a significant main effect of externalizing comorbidity being associated with poorer assertion \( (F_{1,1375} = 3.995, p = 0.046) \). Similar to other subscales, there was no significant main effect of internalizing comorbidity, nor a significant interaction \( (F_{1,1375} = 0.065-0.921, p = 0.337-0.799) \).

**Responsibility.** Teacher data indicated a main effect of externalizing comorbidity, such that children with this comorbidity were rated as having poorer responsibility \( (F_{1,648} = 52.321, p < .0001) \). Internalizing comorbidity \( (F_{1,648} = 0.049, p = 0.825) \), and the interaction between internalizing and externalizing comorbidities \( (F_{1,648} = 1.625, p = 0.203) \), were nonsignificant.

**Empathy.** Teachers rated children with externalizing comorbidity as having poorer empathy \( (F_{1,648} = 23.447, p < .0001) \). No other main effects or interaction reached significance \( (F_{1,648} = 0.168-2.782, p = 0.096-0.682) \).
**Engagement.** There were no significant main effects or interactions in the teacher model for engagement ($F_{1,647} = 0.169-3.182$, $p = 0.075-0.681$).

**Self-Control.** Finally, there was a significant main effect such that externalizing comorbidity was associated with teacher ratings of poorer self-control ($F_{1,1373} = 139.909$, $p < .0001$). The main effect of internalizing comorbidity ($F_{1,1373} = 0.00$, $p = 0.989$), and the interaction between internalizing and externalizing comorbidity ($F_{1,1373} = 0.229$, $p = 0.632$), were nonsignificant.
Chapter 4: Discussion

The current study sought to better understand the social skills profiles of children with ADHD by considering the contribution of comorbid conditions, such as internalizing (e.g., anxiety or depression) and externalizing (e.g., ODD or CD) disorders. Using a sample of 1400 clinically-diagnosed children with ADHD, created from pooling several existing datasets, I analyzed parent and teacher report of children’s global and subdomain specific social skill scores to detect associations with comorbidity status. Results differed depending on the informant (parent versus teacher), and between global versus subdomain scores. Teacher models exclusively implicated externalizing disorders as being associated with poorer social skills, and this was consistently reported across most subdomain scores. Parent models were more nuanced in the unique versus shared contributions of each comorbidity on social skills, and results were more differentiated across specific subdomains. Overall, there is evidence that children with ADHD and comorbidities demonstrate poorer social skills relative to children with ADHD alone, as perceived by multiple informants, and that there may be different patterns of social skills impairment depending on the comorbid condition.

Externalizing Comorbidity

Overall, externalizing comorbidity displayed the most consistent associations with poorer social skills. Both parents and teachers reported global social skills as more impaired in children with a comorbid externalizing disorder, as expected based on previous literature (Booster et al., 2012; Graziano et al., 2011; Becker et al., 2012b), especially the existing literature using parent report. However, my study went beyond this finding to examine the associations between externalizing comorbidity and subdomain specific social skills. Interestingly, not every subscale
appeared to be associated with poorer performance for children with comorbid externalizing disorders.

In the current study, teachers rated assertion, communication, cooperation, responsibility, empathy, and self-control as lower in children with comorbid externalizing disorders. These particular skills have previously been reported as deficits for children with ADHD and externalizing problems. For example, studies have found that children with this diagnostic profile struggle with self-control, emotional awareness, and following rules (Rosen et al., 2014; Factor et al., 2016; Abikoff et al., 2002). Parents in the current study reported similar impaired subdomains as did teachers, rating communication, cooperation, self-control, responsibility, and empathy as lower for this comorbidity group. Teachers reported significant differences in assertion where parents did not, but otherwise the subdomains associated with externalizing comorbidity were consistent across informants. This provides evidence that externalizing-related social impairments are visible across most subdomains, and generally agreed upon by raters.

On the other hand, engagement was not rated by either parents or teachers as more impaired in children with a comorbid externalizing disorder. The engagement subscale taps into the ability to approach peers and join activities, such as by asking peers to play, introducing self, and starting conversations. These specific skills may not be related to externalizing comorbidity among children with ADHD. That is, while these children may not exhibit more difficulty in showing interest in peers’ activities (as evidenced by no significant impairment in engagement), the quality of the interactions themselves may be lower (demonstrated by impaired cooperation and cooperation). Additionally, the majority of the children in my sample with externalizing comorbidity had a diagnosis of ODD (83.9%) as opposed to CD. ODD is specifically characterized by defiance toward adult instructions, whereas CD symptoms involve antisocial
behavior that could be directed toward peers (APA, 2013). Because the engagement subscale focuses more strongly on peer interactions instead of adult-directed social skill performance, ODD may not confer additional risk for problems in engagement. The current study contributes to a growing body of evidence that comorbidity matters when determining the specific pattern of social impairments in children with ADHD.

**Internalizing Comorbidity**

Existing literature has been less consistent regarding whether comorbid internalizing disorders are associated with poorer social skills in children with ADHD, though some work has found this association, specifically in studies using parent reported social skills (Becker et al., 2015; Jensen et al., 2001; Solanto et al., 2009; Van der Oord et al., 2005; Unnever & Cornell, 2003). The current study found that parents, though not teachers, reported a relationship between internalizing comorbidity and poorer global social skills. My finding using a large, well-characterized dataset adds to the literature suggesting that, as opposed to tempering ADHD-related impulsivity to the benefit of social skills (see Jarrett & Ollendick, 2008), internalizing comorbidities may be associated with poorer social skills, at least by parent report.

The current study further examined the subscale-specific domains where children with internalizing comorbidity may have poorer performance. In particular, assertion, responsibility, and self-control were rated by parents as lower in children with an internalizing comorbidity. This demonstrates how social impairment in children with internalizing disorders may be represented by a more nuanced pattern of deficits, which would not be elucidated by simply considering global scores.

Conceptually, the particular subdomains of social skills associated with internalizing comorbidity align with known areas of challenge for children with internalizing problems.
Indeed, deficits in these specific subscales have previously been found to be associated with depressive disorders in children (Feldman et al., 2017). The assertion subscale includes behaviors like introducing oneself to others and asking for help; this might be a struggle for children who worry about making mistakes, fear being judged by others, or experience low mood. Responsibility involves communicating effectively with adults, which may again be reasonably linked to the nature of internalizing disorders. Lastly, self-control probes for responding to conflict, which may initially seem to be exclusively associated with externalizing disorders. However, items such as “responds appropriately to teasing” do not indicate what the child does instead when being teased. That is, a child who lashes out physically and a child who becomes withdrawn and cries may both be responding inappropriately, in different ways.

**Externalizing + Internalizing Comorbidity**

My study also advances the literature by examining the pattern of social skills associated with children with ADHD and dual comorbidities (internalizing disorders + externalizing disorders). This characterization is thought to describe up to one third of children with ADHD, yet as a field we know little about this group. We specifically examined whether there were statistical interaction effects between internalizing and externalizing comorbidity, and if so, were social difficulties compounded, overshadowed, or exponentially impairing?

Significant interaction effects were found for the outcome measures of parent-reported global social skills, and in the specific parent-reported subdomains of responsibility, self-control, and empathy. For the global score, and the subdomain scores for responsibility and self-control, children with both diagnoses performed similarly to those with externalizing comorbidity alone. In other words, the interactions indicated that any effects of internalizing were overshadowed by externalizing- related impairments. While there is limited research explicitly investigating
interaction effects between internalizing and externalizing comorbidity in children with ADHD, and existing studies report inconsistent results, my findings are consistent with Booster and colleagues (2012) who found that children with both internalizing and externalizing comorbidities performed similarly on social skills relative to children with externalizing comorbidities alone. Notably, global social skills, and the subdomains of self-control and responsibility, were each found to be significantly associated with internalizing comorbidity as a main effect. The interaction effects for these outcomes, however, imply that internalizing comorbidities do not incrementally add to poorer performance in these subdomains when an externalizing comorbidity is present.

Interestingly, the interaction for parent-reported empathy indicated that children with both internalizing and externalizing comorbidities performed better than those with externalizing comorbidity alone. This suggests that the impairments in empathy experienced by children with ADHD and an externalizing disorder may potentially be buffered by the addition of an internalizing diagnosis. Researchers have argued that externalizing behaviors exhibited by children with ADHD might be inhibited by comorbid anxiety disorders (see Jarrett & Ollendick, 2008). If that is the case, it is interesting that this relationship was only visible in the subscale of empathy. Potentially, downstream implications of better empathy could include benefits for emotional awareness, prosocial behaviors, and reciprocated friendships – constructs which should be investigated further as related to internalizing plus externalizing comorbidity. An item-level analysis of differences among comorbidity groups on the empathy subscale might provide additional insight into this finding.
**Parent versus Teacher Report**

Such nuanced relationships between internalizing and externalizing comorbidities were found exclusively on parent-reported social skills, and were not reported by teachers. Instead, teacher-report only implicated externalizing disorders as being associated with poorer social skills across both the global score and subdomains. As one example, for the subscale of assertion, internalizing comorbidity was uniquely associated with poorer scores on parent report, whereas externalizing comorbidity was associated with poorer scores on teacher report. Neither internalizing disorder nor the interaction between comorbidity types was significant in any teacher models.

Taken together, these results first indicate that for teachers, social behaviors associated with comorbid externalizing disorders in children with ADHD are quite impairing in the classroom. Indeed, the consistent documentation of particularly poor teacher-student relationships among children with ADHD and externalizing comorbidity (Ewe, 2019; Rushton, Giallo, & Efron, 2020) may reflect this finding.

Second, the informant discrepancies between parent and teacher report are especially interesting, and previously reported in studies investigating social skill performance in children with ADHD (Becker et al., 2015; Jensen et al., 2001; Feldman et al., 2017; Becker et al., 2012b). Such stark differences may reflect the nature of social impairment associated with each comorbidity. Externalizing-related social difficulties might be disruptive in the moment and require immediate correction (e.g., poor cooperation interfering with class group assignments), whereas internalizing-related impairments may be hard to notice in an environment where a teacher must manage many children at once (e.g., poor assertion manifesting as an inability to
ask the teacher for help when needed). At home, parents may have more bandwidth to notice such internalizing-related behaviors and identify them as social difficulties.

Even when both comorbidity types may be associated with deficits in the same social skills subdomain, the expression of the social difficulty could vary based on comorbidity. While a child with ADHD and an externalizing disorder may demonstrate deficits in responsibility by talking back to adults, a child with an internalizing comorbidity might manifest responsibility deficits by avoiding interaction with adults altogether. Similarly, issues in communication may look like breaking rules for children with externalizing comorbidity versus an inability to join others at play for children with internalizing comorbidity. This pattern of approach versus avoidance depending on the comorbidity may theoretically help explain why parents are more likely than teachers to report associations between social difficulty and internalizing disorders. It may also be the case that teachers see different behaviors than are visible at home, or that the school and home environments require somewhat different social skills. Future research should continue to probe why informant discrepancies are so prevalent, and what they might suggest about both measurement and social performance in children with ADHD.

**Study Strengths and Limitations**

Strengths of this study include its large sample size, comprised of children who each had undergone comprehensive clinical assessments for ADHD and common comorbidities. That children with ADHD drew from many different research groups and geographic locations across the United States and Canada (which I accounted for in data analyses) increases the potential generalizability of results. I also had parent- and teacher-reported data for all children, allowing me to investigate how the pattern of results varied by informant.
One study limitation is that some datasets contained ratings that used the SSIS, whereas others used its predecessor, the SSRS. For analyses, I combined the SSIS and SSRS, but this limited the sample size for particular subdomain scores that were only present on the SSIS. Additionally, the present study considered children who had either anxiety and/or depression as having internalizing comorbidity, and children who had either ODD or CD as having externalizing comorbidity. In this sample, anxiety and ODD were far more common comorbidities than depression and CD, perhaps due to the age of the children. Future studies that encompass a larger age range might take into account which internalizing or which externalizing comorbidity the child has, to determine if an even more precise comorbidity group yields distinct patterns of social skill impairment. Similarly, future work should include other diagnoses commonly comorbid with ADHD, like autism spectrum disorder (ASD), to help to parse apart the shared versus unique social impairments and behaviors between these diagnoses, and how their co-occurrence relates to specific social skill performance (Mikami, Miller & Lerner, 2019).

**Clinical Implications**

Given the current challenges in developing interventions to improve social skills in children with ADHD (Morris et al., 2021), it is important to think about whether interventions could be tailored based on comorbidity, and whether this could result in more efficacious treatments. The present study may have important clinical implications by providing insight into how comorbidity status may relate to social skills needs and by extension, intervention targets. A child with ADHD and an externalizing disorder might benefit from different training compared to one with an internalizing comorbidity (Antshel & Remer, 2003). Further, the patterns of impairment demonstrated in this study lend credence to the concept that social skills are a constellation of behaviors that can learned independent of one another. For other populations
with social impairment as either a core feature or functional outcome of their syndromes (e.g., ASD, ODD on its own, anxiety on its own), such a nuanced understanding may also be helpful in developing and disseminating effective treatments. Ultimately, the current study could provide important direction for improving current interventions, or for generating novel interventions that are personalized based on individual characteristics of the child, like comorbidity status.

**Summary**

Children with ADHD are well-known have social difficulties, and the addition of comorbid conditions complicates this presentation. This study found that comorbid disorders tended overall to be associated with poorer social skills, in both the global score and in specific subdomains, among children with ADHD. Nonetheless, results varied based on specific subscale, and across informants. While parents reported a more nuanced pattern of skill impairments associated with externalizing relative to internalizing comorbidity, teachers implicated only externalizing comorbidity as associated with poorer social skills. Results from this study might inform ways to tailor future social skill trainings for children with ADHD based on comorbidity, with the goal of ultimately helping these children to improve their social performance.
### Table 1

**Dataset Demographics**

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**Note:** AA = African American/Black; ADHD-I = Attention Deficit Hyperactivity Disorder, Inattentive Presentation; ADHD-HI = Attention Deficit Hyperactivity Disorder, Hyperactive-Impulsive Presentation; ADHD-C = Attention Deficit Hyperactivity Disorder, Combined Presentation; A = Asian; C = Caucasian/non-Hispanic; CD = Conduct Disorder; H = Hispanic/English-speaking; M = Mixed Race; O = Other Ethnicity; ODD = Oppositional Defiant Disorder.
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<td>Parent endorsements on DISC, parent and teacher SNAP elevations, child-report internalizing symptoms</td>
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*Note:* ADHD-RS-5 = ADHD Rating Scale (DuPaul et al., 2016); CSI-4 = Child Symptom Inventory (Gadow & Sprafkin, 2002); DISC = Diagnostic Interview Schedule for Children (Shaffer et al., 1996); KSADS = Kiddie Schedule for Affective Disorders and Schizophrenia (Axelson et al., 2009); SNAP = Swanson, Nolan and Pelham rating scale (Swanson, 1981); SSIS = Social Skills Improvement System; SSRS = Social Skills Rating System.
### Table 3

*Descriptive Statistics*

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<th>Variable</th>
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*Note:* Two social skills scales were used in this study: the Social Skills Improvement System (SSIS) and its predecessor, the Social Skills Rating System (SSRS). While they largely overlap in their subscales (cooperation, assertion, responsibility, empathy, and self-control), the SSIS includes two subscales not on the SSRS, namely communication and engagement. There were 671 children whose raters completed the SSIS, as opposed to the full sample of $N = 1400$. 


Table 4

*Bivariate Correlations between Parent- and Teacher-Rated Social Skills*

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</table>

*Note: * = correlation greater or equal to 0.70. AS = Assertion; CM = Communication; CP = Cooperation; EG = Engagement; EM = Empathy; GL = Global; RS = Responsibility; SC = Self-Control.
### Table 5

**Group Differences in Parent- and Teacher-Reported Social Skills**

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*Note:* * = p < 0.05, ** = p < 0.005, *** = p < 0.001. All findings were obtained from a multilevel model with participants nested in data collection site, with higher scores reflecting better respective social skill performance. Due to differences between the SSRS and SSIS, certain subscales were only available for a subset of participants. DFn = Degrees of Freedom Numerator; DFd = Degrees of Freedom Denominator.
Figure 1

Interaction Effects on Parent-Reported Social Skills

Note: All interaction effects are from parent-report models. A. represents the global social skills score, B. represents responsibility, C. represents empathy, and D. represents self-control. ADHD=no comorbidity, DUAL= ADHD and both comorbidities, EXT=externalizing comorbidity only, INT=internalizing comorbidity only.
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functioning of children with and without ADHD. *Journal of Attention Disorders, 15*(6), 473-484.


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