Journal of Obsessive-Compulsive and Related Disorders 2 (2013) 281–285

Contents lists available at SciVerse ScienceDirect

Journal of Obsessive-Compulsive and Related Disorders

journal homepage: www.elsevier.com/locate/jocrd

Short communication

Effects of tic-related conversation on rate of tics in two siblings

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ARTICLE INFO

Article history:
Received 2 February 2012
Received in revised form
21 May 2013
Accepted 22 May 2013
Available online 29 May 2013

Keywords:
Tourette's syndrome
Tics
Functional analysis
Behavioral assessment

ABSTRACT

This study examined the effects of tic related conversation on motor and vocal tics in two siblings ages 11 and 12 diagnosed with Tourette's syndrome. Using a multi-element design, the siblings were exposed to tic related conversation that was directed toward each sibling individually and with both siblings. A non-tic-related conversation served as a control condition. For both siblings, the rate of tics was greater during tic-related conversation conditions relative to control sessions. However, there was some variability in responding across siblings and those results are described in detail. Moreover, results are discussed in terms of implications for science and practice as they relate to tic disorders.

1. Introduction

Prevalence of Tourette's syndrome (TS) is more common than once thought with prevalence rates that may be as high as 1% (Olfson, Crystal, Gerhard, Wang, Walkup, Scahil, & Walkup, 2011; Robertson, 2008; Robertson, Eapen, & Cavanna, 2009). TS involves individuals engaging in both multiple motor and one or more vocal tics that occur frequently each day nearly every day or intermittently during a period of more than one year with onset prior to 18 years of age (American Psychiatric Association, 2000). For some individuals with TS, symptoms may be mild or manageable and may not warrant clinical attention. However, for many individuals with TS, symptoms greatly interfere with major life activities (e.g., school, social functioning). In fact, chronic tics by children increases their risk of being bullied and rejected by peers (Boudjouk, Woods, Miltenberger, & Long, 2000; Storch et al., 2007). Individuals with TS or Chronic Tic Disorder experience greater bullying rates than children without tic disorders (Storch et al., 2007). Not surprisingly, children that exhibit a motor tic are less socially accepted than those who do not exhibit motor tics (Boudjouk et al., 2000). Moreover, Boudjouk et al. found that adolescents that exhibit tics are rated less favorably by peers than adolescents with other medical conditions such as diabetes. Given the social and emotional risks associated with tic disorders, quality assessment and treatment is essential for reducing negative developmental and social outcomes.

Tics associated with TS have long been considered biologically based. Amongst health care providers there is limited discussion of behavioral assessment and intervention for tic disorders. This is somewhat surprising given that effective behavioral intervention for tics associated with TS has been widely researched for more than 40 years (e.g., Azrin & Nunn, 1973). More recently, Piacentini et al. (2010) conducted a randomized control trial of Comprehensive Behavioral Intervention for Tics (CBIT), which includes habit reversal, and found that participants in the CBIT group displayed significantly greater decreases in tic severity when compared to a control group that received supportive therapy and education. Additionally, Cook and Blacher (2007), used evaluation criteria set forth by APA's Task Force on Promotion and Dissemination of Psychological Procedures (APA, 1995) and found that habit reversal, was a *well established treatment*.

In addition to well documented behavioral interventions for tics, an emerging body of research is available demonstrating the impact of contextual variables on tic expression (Anderson, Vu, Derby, Goris, & McLaughlin, 2002; Carr, Taylor, Wallander, & Reiss, 1996; Conelea & Woods, 2008; Conelea, Woods, & Brandt, 2011; Dufrene et al., 2013; Malatesta, 1990; Richman & Lindauer, 2002; Roane, Piazza, Cercone, & Grados, 2002; Storch et al., 2007; Watson, Dufrene, Weaver, Butler, & Meeks, 2005; Watson & Sterling, 1998; Woods, Watson, Wolfe, Twohig, & Friman, 2001). Contextual variables that impact tic expression include emotional states (e.g., anxiety), specific antecedents (e.g., task demand, tic related conversation), and consequences (e.g., contingent attention, escape from task demands).

One particularly interesting finding in the tics literature is that tic-related conversation may exacerbate rate of tics. Woods et al.

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http://dx.doi.org/10.1016/j.jocrd.2013.05.004

(2001) found that a tic-related conversation condition, relative to a non-tic-related conversation condition, resulted in a substantial increase in tics for two boys with TS. Increases for motor tics were less consistent. Additionally, Dufrene et al. (2013) included tic-related conversation conditions in functional analyses, and found that tic related conversation resulted in substantial increases in motor and vocal tics for two boys with TS. The impact of tic-related conversation on rate of tics is intriguing for a number of reasons. First, intake interviews with individuals with tic disorders often include tic-related conversation. If tic-related conversation exacerbates tic occurrence, then clinicians' judgment of tic severity may be inflated. Second, if an individual's tics are exacerbated by tic-related conversation, then treatment may include targeting tic-related conversation as a stimulus condition that exacerbates tic occurrence. For example, when implementing competing response training within habit reversal, a therapist may have a client practice their competing response during tic-related conversation so as to prepare the individual to use their competing response during an event that is most likely to exacerbate tic occurrence. Additionally, for children in particular, teachers may be instructed to limit tic-related conversation and use non-verbal gestures when prompting a student to engage in their competing response after the student fails to do so independently.

The present study was designed to replicate and extend previous research evaluating impact of tic-related conversation on tic occurrence. First, only two studies (Dufrene et al., 2013; Woods et al., 2001) have experimentally evaluated this phenomenon and several replications are needed to determine the consistency of the finding. Second, this study includes a novel tic-related conversation condition. The participants in this study were siblings and all conditions were implemented with both siblings present. As a result, we were able to evaluate the impact of tic-related conversation directed to each sibling individually and tic-related conversation directed at both siblings. Thus, data are provided for the impact of tic-related conversation directed to one individual and tic-related conversation directed toward an adjacent individual.

2. Method

2.1. Participants and setting

Charles (M) and Brittan (F), referred to by pseudonyms, were 11 and 12-year old siblings, respectively, who had been previously diagnosed with TS. Charles had previous comorbid diagnoses of Mood Disorder Not Otherwise Specified and asthma and received clonidine (0.1 mg), dextroamphetamine (10 mg), olanzapine (1.25 mg), carbamazepine (400 mg), and paroxetine (20 mg) throughout the study. Per a neuropsychiatric report, Charles was reported to have a history of "superior intelligence." School performance was reported to be above average. Brittan had a previous comorbid diagnosis of Obsessive Compulsive Disorder (OCD) and was taking guanfacine (1 mg) and paroxetine (10 mg) throughout the study. No information was available regarding Brittan's cognitive functioning, although cognitive functioning appeared to be at least average. School performance was reported to be above average. Tics for Charles and Brittan, as reported by both children and their parents, were subjectively described as moderate with regard to frequency, severity, and impact on daily functioning. Charles and Brittan reported that they continued to exhibit motor and vocal tics at a moderate rate despite medication for tics.

All data were collected at a university-based counseling center on a mid-sized university campus in the southeastern United States. All sessions were conducted in a large family style therapy room that was equipped with a video camera linked to a video control room within the counseling center. Charles and Brittan sat facing the camera during all sessions.

2.2. Experimental design and data collection

2.2.1. Experimental design

This study included a multi-element design with a control condition and three experimental conditions. The control condition was implemented during four 5 min sessions and each experimental condition was evaluated during two separate 5 min sessions. All sessions were conducted across two clinic sessions that each lasted approximately 1 h. There was a 2 min break between sessions. The four conditions included (A) non-tic-related conversation – the control condition, (B) tic-related conversation directed toward Charles, (C) tic-related conversation directed toward Brittan, and (D) tic-related conversation directed toward both siblings. The tic-related conversation directed to Charles and tic-related conversation directed to Brittan conditions were counterbalanced to minimize the likelihood of order effects. However, it was impossible to counterbalance the tic-related conversation directed to both siblings because both siblings were simultaneously exposed to that condition. Data were analyzed for level, trend, and stability.

2.2.2. Response definitions and data collection

Two male graduate students (first and fourth authors) in school psychology conducted clinic sessions and collected all data for this study. Both graduate students were in their third year of doctoral training and had previously taken advanced course work in child psychopathology, applied behavior analysis, behavioral interventions, and behavioral assessment. The graduate students had been previously trained to conduct observations for multiple behaviors and environmental events to a 90% agreement criterion. Moreover, prior to collecting data and coding video tapes, the first author developed operational definitions for the dependent variable and reviewed the definition with the second observer. Neither observer had any prior interactions with the participants prior to the initial intake session.

For Charles, motor tics were defined as head, shoulder, and body jerking while vocal tics were defined as throat clearing and grunting. For Brittan, motor tics were defined as rapid hand and finger jolting while vocal tics were defined as squeaking and snorting. Both participants and two clinicians were present during all sessions. All sessions were recorded with a video camera located in the top corner of the room. The participants were aware of the videotaping so reactivity to observation was possible. However, in order to minimize the impact of reactivity to observation, Charles and Brittan were seen for multiple sessions (e.g., intake, follow-up assessment) in the therapy room prior to data collection for this study. The frequency of motor and vocal tics combined was recorded for each participant during 5 min sessions and results are reported as total tics per minute. Motor and vocal tics were collapsed because vocal tics occurred infrequently for both participants.

2.3. Procedure

Four conditions were used to evaluate the impact of tic-related conversation on rate of tics. During the non-tic-related conversation sessions (A), the therapists spoke with both siblings about issues unrelated to tics or any other presenting problems. Examples of non-tic-related topics included music, sports, and leisure activities. Additionally, the therapists did not acknowledge a tic by either children and planned to redirect the children in the event that tic behavior was mentioned, although neither child independently discussed tics during the condition. During the tic-related conversation with Charles condition (B), both therapists directed tic-related conversation toward Charles. Tic-related conversation with Charles consisted of, but was not limited to, descriptions of his tics, antecedents to and social consequences associated with his tics, as well as his ability to suppress tics. During the tic-related conversation with Brittan condition (C) the therapists directed tic-related conversation toward Brittan. Tic related conversation with Brittan was identical to tic-related conversation with Charles. During the tic-related conversation with both siblings (D), the therapists directed tic-related conversation toward both siblings. Specifically, each child was asked to describe the other sibling's tics as well as discuss their own tics in more detail. The clinicians ignored any tics exhibited by either participant across all conditions. During B, C, and D conditions, if a therapist asked Charles or Brittan to demonstrate a tic and that specific tic was immediately demonstrated by Charles or Brittan, respectively, then that tic was not scored and figured into the calculation for tics per minute. For example, if a therapist asked Charles to demonstrate a shoulder jerking tic and Charles immediately (i.e., within 3 s) demonstrated a shoulder jerking tic, then observers did not score that tic. This was done so that therapist requested tic demonstrations during B, C, and D conditions did not artificially inflate tic rate during tic-related conversation conditions.

2.4. Interobserver agreement and procedural fidelity

A second observer independently scored all sessions for interobserver agreement (IOA). IOA was calculated by dividing the smaller number of tics recorded by the larger number of tics recorded and multiplying by 100. Mean IOA for Charles was 81% (range, 59–94%) and mean IOA for Brittan was 80% (range, 64–100%). The large range of IOA coefficients was likely due to the less than optimal quality of video and audio recordings and the subtle nature of some of the tics. Additionally, for some sessions, few tics occurred, and as a result, minor disagreements resulted in very low IOA coefficients because of the nature of the IOA formula. Prior to coding the observations, the first author was designated as the primary observer and when disagreements occurred, the primary observer's score was included in

the graph of results. Procedural integrity for experimental conditions was evaluated for all sessions. An independent observer watched all sessions to determine whether or not any procedural violations had occurred. Specifically, the observer was instructed to report whether or not any tic-related conversation occurred during non-tic-related conversation sessions or if any tic-related conversation was directed toward the sibling not targeted for tic-related conversation for a particular session. The independent observer reported that no procedural violations had occurred.

3. Results

Fig. 1 includes results for Charles and Brittan. Charles' data are presented in the top panel of Fig. 1. During control condition sessions, Charles' rate of tics was low and stable. When tic-related conversation was directed toward Charles, level of tics was stable and greater than the level observed during control sessions. During the first session in which tic related conversation was directed to Brittan, rate of tics was similar to the rate observed during control sessions; however, during the second session, rate increased sharply to a level far greater than rate observed during the control sessions. Across all tic-related conversation sessions, Charles' mean rate of tics was 6.8 compared to an average of 2.5 tics per minute during the control sessions. Additionally, tic-related conversation directed toward Charles alone resulted in an average of 6.5 tics per minute, while average rates during tic-related conversation directed toward Brittan and both siblings were 7.3 and 6.6, respectively.

The bottom panel of Fig. 1 includes Brittan's data. Brittan's rate of tics was somewhat variable during control sessions, but level was generally low. During sessions in which tic related conversation was directed to her and to Charles, rate of tics was greater than rate observed during control sessions, albeit with a decreasing trend. During the first session in which tic-related conversation was directed to both siblings, Brittan's rate of tics was far greater than rate observed during control sessions; however, during the second session, rate of tics sharply decreased to a level similar to the level observed for control sessions. Brittan's mean tic rate across all tic-related conversation sessions was 4.73, while mean tic rate for non-tic-related conversation sessions was 3.1. Additionally, tic-related conversation directed toward Brittan alone resulted in an average of 5.9 tics per minute, while tic rates during tic-related conversation directed toward Charles and both siblings were 4.3 and 4, respectively.

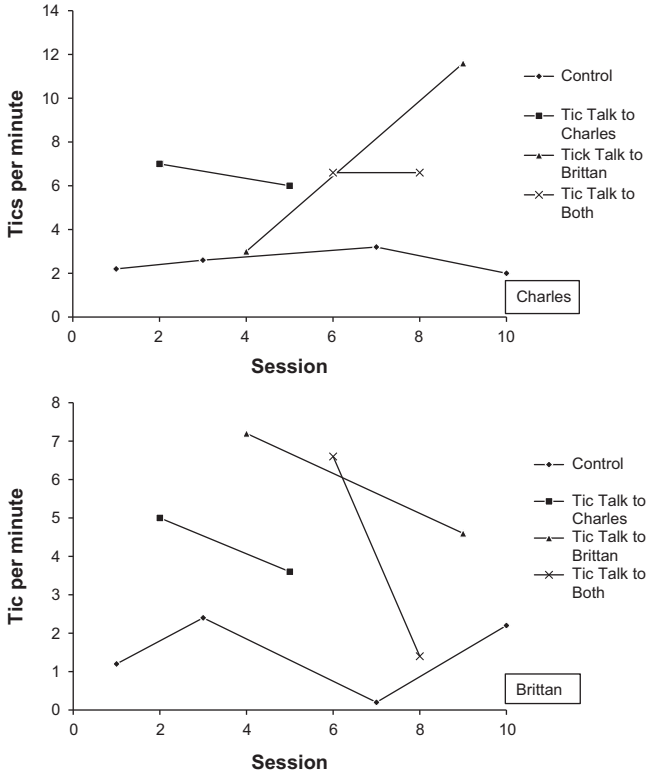

Fig. 1. Tics per minute.

4. Discussion

This study provides several contributions to the TS literature. First, experimental studies demonstrating the impact of tic-related conversation on rate of tics is limited. Only two studies to date have evaluated and demonstrated an effect for tic-related conversation on tic occurrence. Results from this study are consistent with findings from Woods et al. (2001) and Dufrene et al. (2013) in which tic-related conversation exacerbated tic rate for children with TS. Results from this study demonstrate that during tic-related conversation sessions, both participants engaged in a greater rate of tics relative to control sessions in which the conversation did not include mention of tics. However, there are some fine differences worthy of expanded discussion. While Dufrene et al. (2013) found an effect for tic-related conversation on motor tics, Woods et al. (2001) found an effect for vocal tics, but not motor tics. In this study, the majority of tics exhibited by the two children were motor tics. As a result, additional evidence is provided for tic-related conversation increasing rate of motor tics. Additional replications are needed to determine the consistency of findings from this study and those obtained previously.

Second, this study extends previous research by Woods et al. (2001) and Dufrene et al. (2013) by evaluating a novel tic-related conversation condition. Previously, Woods et al. (2001) and Dufrene et al. (2013) evaluated the impact of tic-related conversation directed toward one individual on that *individual's* rate of tics. In this study, we included an evaluation of the impact of tic-related conversation on *both individuals* when the conversation was directed toward only one person. Results of this study indicate that tic-related conversation directed toward one individual exacerbated tic display for both the targeted individual and an adjacent individual. For Charles, any tic-related conversation, regardless to whom it was directed, resulted in substantial increases in tic display relative to non-tic related conversation sessions. However, for Brittan, when tic-related conversation was directed to Charles, she emitted a greater rate of tics than what was observed during control session, but there was a decreasing trend in rate of tics across the two sessions. Moreover, when tic-related conversation was directed to both siblings, Brittan's rate of tics was initially far greater than what was observed during the control sessions, but there was a sharp decrease in tic-rate during the second session such that tic rate was within the range of scores for control sessions. As a result, the impact of tic-related conversation directed toward an adjacent individual is somewhat mixed with consistent findings for Charles, but not Brittan. These findings are interesting in that they shed additional light on the impact of tic-related conversation on tic display. It may be that tic-related conversation need not be directed solely toward an individual with a tic disorder to exacerbate their tic display. Future research will need to be conducted in order to determine whether or not non-specific tic-related conversation impacts a particular individual's tic display or if certain tic-related words evoke higher rates of tics than words that are non tic-related.

Third, the findings from this study, and previous studies (Conelea & Woods, 2008; Conelea et al. 2011; Dufrene et al., 2013; Woods et al., 2001) have implications for applied practice.

Specifically, clinicians should be aware of the impact of contextual variables (e.g., contingent attention, anxiety, verbal content), including tic-related conversation, on tic display. For tic-related conversation in particular, judgments of tic severity during intake sessions when the topic of conversation is largely tic-related, should be tempered. Moreover, when clinicians do find that tic-related conversation or some other contextual variable exacerbates tic occurrence, then they should plan accordingly with regard to treatment development and implementation. For example, if tic-related conversation exacerbates tic occurrence for a particular individual, then that individual may practice their competing response during simulated, naturalistic tic-related conversation. Additionally, persons who routinely interact with the person with the tic disorder (e.g., teachers, family members) may be instructed to reduce tic-related conversation and discretely refer to a tic if they feel the need to do so.

Fourth, this study provides additional empirical support for the use of behavioral assessment, including functional assessment methodologies, for assessing tic occurrence. Historically, assessment of tics has included indirect assessment with rating scales and interviews (Himle, Woods, Piacentini, & Walkup, 2006). Traditional assessment devices may fail to fully evaluate contextual variables while focusing more on within-person variables. Recent research has identified a variety of contextual variables that impact tic display (Conelea & Woods, 2008; Conelea et al., 2011), so behavioral assessment procedures are uniquely attractive for directly assessing a variety of contextual variables that might impact tic display. Therefore, additional research and dissemination is needed demonstrating the reliability, feasibility, and validity of direct observation of tics.

4.1. Limitations

In this study, we demonstrated that tic occurrence could be reliably measured, and that tic occurrence was sensitive to environmental manipulations. Such evidence is critical for science and practice as they relate to tic disorders. Despite the contributions of this study to the extant tic literature, some limitations warrant discussion and further research. First, as with previous research in this area, we are not able to offer experimental evidence as to the causal mechanism for tic-related conversation's impact on tic occurrence. Future research could include a neuroimaging study, with conditions similar to what were reported in Kopell and Greenberg (2008). The key difference would be to measure the brain activity of a TS patient during non-tic-related conversation and again during tic-related conversation. Subsequently, the behavioral data on motor and vocal tics could be superimposed over the data showing brain activity in the experimental conditions. In this regard, we could programmatically arrive at a clearer understanding of the brain mechanisms underlying motor and vocal tics.

A second limitation of this study is that it included only two participants, which limits its generality. Each of the two previous studies evaluating the impact of tic-related conversation on tic occurrence also included two participants. As a result, more replications are in order so that the consistency of these, and previous, findings can be evaluated. Third, IOA data were collected for all sessions and there was some variability in IOA with some coefficients being below the minimum accepted threshold (i.e. below 80%). It is important to note that overall IOA was greater than 80%. Third, for the tic-related conversation conditions, only two data points were collected per condition, and sessions were only 5 min in length. Previous functional analysis research has found that brief functional analyses with brief sessions (e.g., 5 min) may be unreliable (Kahng & Iwata, 1999; Wilder, Normand, & Atwell, 2005). This study was conducted in the context of applied practice and more extended analyses with several sessions per condition were not feasible. Regardless, future research should evaluate the impact of tic-related conversation on tic display by conducting lengthier and more numerous sessions per condition so that greater confidence can be had in the reliability of findings. Finally, this study does not include data regarding the proportion of condition spent in expressive speech versus listening for each participant. As a result, we were not able to report data for rate of tics during time spent engaged in expressive speech versus time spent listening to others speak. Therefore, we do not know if the participants engaged in greater rates of tics while speaking, or listening to others speak about tics.

In conclusion, this study provides additional empirical evidence for the reactive nature of tics to tic-related conversation. The data presented here build on the small, but emerging, literature on the relationship between contextual variables and TS. Future research is no doubt needed to expand the science and practice of behavioral assessment of tics.

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