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Connected Rhythm: A Scoping Review of Therapeutic Drumming as an Intervention for Autistic Individuals

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Abstract

Background: Autism Spectrum Disorder (ASD) is a neurologically-based developmental disorder representing a subdomain of neurodivergence. Occupational therapy intervention for ASD typically incorporates sensory modalities, addressing a multitude of challenges, including mental health outcomes. This scoping review analyzes available evidence of the sensory-based intervention of therapeutic drumming (TD) to improve mental health in autistic clients.

Method: Following the Johanna Briggs methodological framework, Proquest, Ebsco, Scopus and OTseeker databases were searched with the key and related words of “autism,” “therapeutic drumming,” and “mental health,” yielding 448 articles. After removal of duplicates and application of inclusion criteria, seventeen articles were included in the final analysis.

Results: Analysis revealed strong consistency in delivery and implementation of TD intervention. Instrumentation of outcome measures, in contrast, was not well-synchronized; therefore, efficacy of the intervention was difficult to assess.

Conclusion: Limitations included a general lack of research, limited research of TD with autistic people in occupational therapy literature, and a dearth of strongly instrumented research. This review revealed valuable contributions of TD interventions as a neurodiversity-affirming practice to support mental health and inform future studies of implementation of TD for people with ASD across the lifespan within the scope of occupational therapy.

Comments

The authors declare that they have no competing financial, professional, or personal interest that might have influenced the performance or presentation of the work described in this manuscript.

Keywords

autism, ASD, mental health, therapeutic drumming, neurodiversity-affirming practice

Credentials Display

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Autism is a neurologically-based developmental disorder characterized by significant social and sensory challenges and repetitive/restrictive behaviors (Kulage et al., 2020). The prevalence of autism continues to rise in the United States, with frequency as high as 1 in 54 people (Kulage et al., 2020). Autism is one of the several diagnoses or conditions that fall under the larger umbrella of neurodivergence (Kornblau & Robertson, 2021). Neurodiversity-affirming practice refers to the understanding, acceptance, and inclusion of different (i.e., divergent) ways of thinking and processing (Dallman et al., 2022). Dallman et al. (2022) emphasized the importance of incorporating autistic perspectives, preferences, and voices into therapeutic practice as a “moral imperative” (p. 1). Current research necessitates greater support for autistic individuals, not just during early school years but later on throughout their lifespan (Dallman et al., 2022; Kornblau & Robertson, 2021). The confluence of varied adversities faced by people with autism may contribute to statistically significant increases in comorbid health issues, including challenges related to mental health (Fitzpatrick et al., 2017). The need to address mental health issues in this population is imperative, as research indicates that improvement in mental health has a positive effect on other functional domains, such as improved sensory processing and motor skills (O’Brien, 2018). Finding ways to meaningfully incorporate autistics’ preferences, interests, and autonomy into their therapy in order to yield improved occupational performance falls squarely within the scope of occupational therapy practice.

Therapeutic Drumming (TD) is one such treatment methodology. TD leads to a potentially restorative impact on both participants and group facilitators and falls ideologically and practically well within the scope of practice of occupational therapists (AOTA, 2020; Litchke et al., 2019; Litchke et al., 2021). For the purpose of this scoping review, “drumming,” or “therapeutic drumming,” is defined as an intervention approach designed for a specified population, embedding aspects of percussion music, whereby a drum, ball, or object is tapped, hit, shaken, or struck with a stick or body part (Ekins et al., 2019; Willemin et al., 2018). TD interventions typically occur in 25- to 60-min time blocks and include movement, music, following directions, and working in a dyad or group while physically facing a partner, facilitator/leader, or circle of drummers (Litchke et al., 2019).

Research suggests that participation in the group experience of drumming, whether as an active member or in a facilitator role, can improve mental health outcomes (Litchke et al., 2021). Neurotypical college students who engaged in TD as either service learning or intentional mental-health technique showed personal improvements in mental health (Litchke et al., 2019). Recently, Plastow et al. (2018) described the positive effects reported by adults with mental health challenges on their enjoyment of TD, as well as improved clinical outcomes on mood and anxiety symptoms. Interventions for autistic individuals often include sensory-based modalities such as TD (Amonkar et al., 2021). Sensory-based modalities have been demonstrated to improve overall sensory modulation and processing, occupational performance, and social-emotional skills (May-Benson & Koomar, 2010).

Several recent systematic reviews support using creative and musical interventions for autistic individuals while providing potential mechanisms for the design of effective music-based programming (Amonkar et al., 2021; James et al., 2015; Marquez-Garcia et al., 2021). In both the Amonkar et al. (2021) and James et al. (2015) studies, the authors identified the need for additional research to study further the effects of music-embedded approaches to improve outcomes for autistic individuals. A combination of neuroimaging, behavioral, and functional tools was recommended by researchers to increase the fidelity of outcome measures and the level of rigor in the data collection of music-based interventions (Marquez-Garcia et al., 2021). TD interventions appear in the literature as stand-alone methods; yet, they are often implemented in conjunction with other music- and rhythm-based interventions, as these practices show

conceptual and practical similarity to music-making, dance, metronome, yoga, and mindfulness, among others (Litchke & Bracken, 2018; Litchke et al., 2019; Gesualdo et al., 2020).

TD interventions are not unique to the autistic population, as they have been used across the globe and the lifespan to improve the mental health and well-being of varied populations, both inside and outside the research arena (Durojaye, 2017). While the research base supporting TD as an intervention method is in its relative infancy, many countries have longstanding cultural traditions of drumming related to the positive emotional and social effects as well as practical uses of percussion instruments (Durojaye, 2017). A case in point may be the historically significant African drumming, which has been an integral part of communal connection and emotional experience in African culture for centuries (Durojaye, 2017). Given the cultural and historical significance of rhythm-based practices, occupational therapists can consider unique client factors, faiths, and preferences when incorporating TD interventions into their practice (AOTA, 2020).

Finally, the effectiveness of TD for the autistic population is a relevant topic of exploration, as practitioners and researchers have begun developing various rhythm methodologies to serve autistic people (Kaur & Alias, 2021; Litchke & Bracken, 2018). These drumming practitioners are a geographically and professionally diverse group. Location-wise, they hail from North and South America, Africa, the Far East, and Europe, as well as from various fields of education (early childhood, special, and adolescent education), creative arts (dance, music), and therapies (therapeutic recreation, occupational and speech therapy) (Amonkar, 2021). The motor, sensory, and social differences noted in autism, for which TD intervention may be strongly matched, have been described across psychological and therapeutic research (James et al., 2015; Kulage et al., 2020). TD, a music and rhythm-based sensory intervention approach, has strong potential to support the mental health of autistic individuals, as it incorporates social-emotional, motor, and sensory domains (Litchke & Bracken, 2018).

The therapeutic impact of drumming and musical therapies to address skills, well-being, and mental health throughout the lifespan is an emerging area of research with a growing body of evidence (Amonkar et al., 2021). What has not yet been well explored is the specific impact of TD on the mental health and well-being of autistic individuals throughout the lifespan (Litchke & Bracken, 2018; Litchke & Hutson, 2021). This research aims, therefore, to answer the following inquiry: Via scoping review methodology, what evidence exists, both in and external to occupational therapy literature, pertaining to TD to improve or support the mental health of autistic individuals?

Method

According to Munn et al. (2018), a scoping review may be undertaken for critical appraisal of a topic either as a precursor to a systematic review or simply to identify gaps in the literature. The current study aimed to identify available sources of data on a relevant topic upon which more research could be built. Scoping reviews begin with a clear research question, followed by database searching on a specific topic, narrowing results to inclusionary studies, and creating a clear data table of the included studies, resulting in a report and synthesis of current research (Jordan et al., 2019). The step-by-step process undertaken in this review is based on the Joanna Briggs Institute model and is delineated below (Jordan et al., 2019).

Research Question Identification

The research question for the current scoping review was “What studies and knowledge are published in English-language, peer-reviewed literature informing practice on therapeutic drumming to support mental health and well-being in the autistic population?”

Database Searching: Article Identification

A wide variety of search words were incorporated into the database search to allow for as many articles as possible to be initially identified. ProQuest, Ebsco, Scopus, and OTseeker were used for the initial search from January through February 2022. In this phase, the second author, an experienced occupational therapist and subject-matter expert in TD, provided input to refine keyword searches, identify pertinent articles/databases, and use varied descriptive search terms to inform this search. The following search terms in various combinations were included: ‘Drumming*’ OR ‘Therapeutic Drumming’ OR ‘percussion’ OR ‘rhythm’ OR ‘music’; ‘autism’ OR ‘ASD*’; ‘mental health’; ‘motor’. Because of the specificity of the topic, no date limits were set, thereby allowing for the inclusion of studies not limited by the year of publication. A total of 448 studies were identified.

Screening of Studies for Eligibility

A review of the 448 studies was completed resulting in the removal of 42 duplicates. To determine which titles met criteria for inclusion, the authors created an inclusion/exclusion table (see Table 1). To meet inclusion criteria, the authors required the title of study and the abstract to include information on some form of drumming in a therapeutic capacity and ASD. Following the initial search of the four databases, Cochrane database and Google Search were additionally used to ascertain whether further studies met the criteria for inclusion. No other studies were found that had not been previously identified.

Table 1
Inclusion And Exclusion Criteria

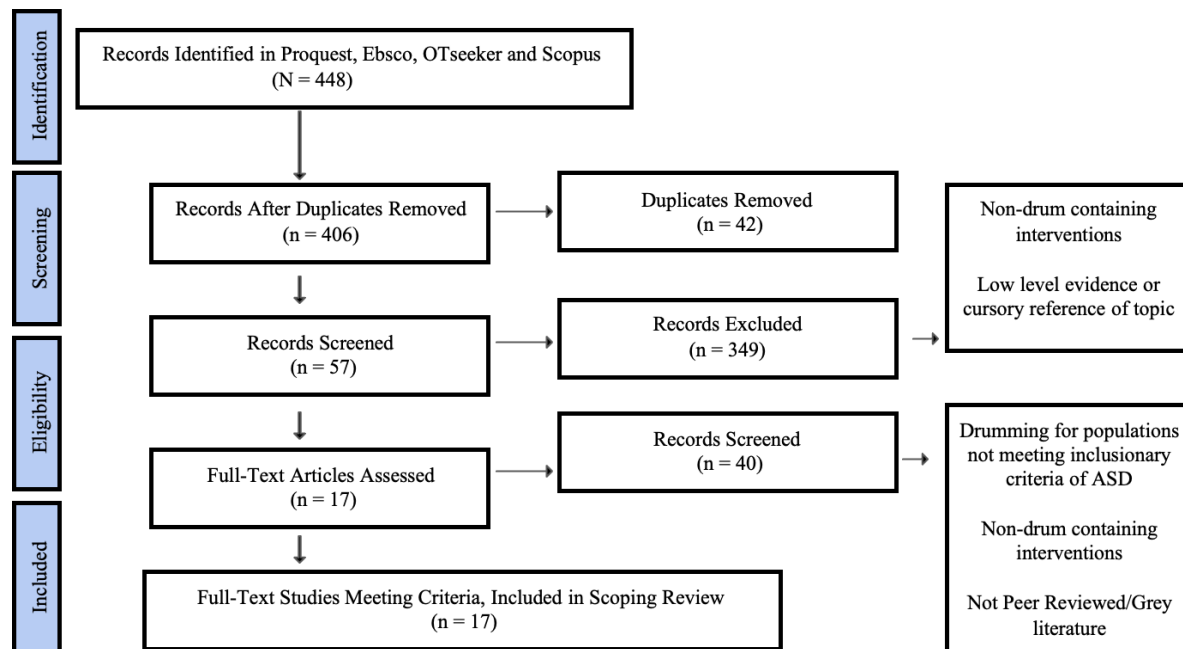
Criteria	Inclusion	Exclusion
Language	English	Non-English
Publication	Peer-Reviewed	Not Peer-Reviewed
Drum/Music/Percussion or Rhythm in Article Title	Specified language to this intervention in title	Title did not include specified language to this intervention
Autism/ASD/Disability or Children in Title	Specified diagnostic criteria or children in title	No specified diagnostic criteria or children in title
Type of Article/Intervention	Intervention clearly connected to/containing drumming component	Intervention contained little/no drumming component
Population/Sample	Autistic people included in study	Unclear/no autistic people included in study
Mental Health Component	Mental health clearly stated in title or in outcome measures	Mental health not clearly stated in title or outcome measures

The process described below conformed with the Preferred Reporting of Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 methodology (Radua, 2021). Titles and abstracts of articles were screened, with 57 articles remaining in the retained category. Following the second pass via an independent review and researcher agreement, only 17 articles remained in the retained category for eligibility. At this point, full-text articles were ordered and reviewed one more time, with 17 being confirmed to meet the inclusion criteria per researcher consensus. The excluded articles were non-intervention based, for a non-autistic inclusive population, or non peer reviewed. It must be noted that nomenclature in the group of included studies varied from article to article, such as “drumming” being referred to in several of the articles as “multi-modal rhythm based,” “percussion,” or even “proactive

musical engagement” (Boso et al., 2007; Kaur & Alias, 2021; Smith et al., 2019). Similarly, “autism” was not always clearly stated, nor did it necessarily appear in the title; yet, at times, it was included in an umbrella with “intellectual disabilities,” “emotional and behavioral disabilities,” and “cognitive development disorders” (Litchke & Hutson, 2021; Lowry et al., 2018; Yang et al., 2021). Finally, specified modes/brands of rhythm intervention may or may not have been specified in the title and methodology, including “African drumming,” “Drumtastic,” “Drums Alive,” “Sounds of Intent,” “Rock Drumming,” “Rhythmic Arts,” and “Movement and Music Program” (Ekins et al., 2019; Gonzalez, 2015; Kaur & Alias, 2021; Litchke & Bracken, 2018; Locke & Clark, 2009; Lowry et al., 2019; Smith et al., 2019; Yang et al., 2021). Because of the language discrepancies and general lack of research, qualitative and case studies were included in the review, and rigorous analysis of the content in each article was undertaken to ascertain whether inclusion criteria were met. See Figure 1 for a visualization of the article selection process.

Figure 1

PRISMA Flow Chart: Article Selection Process



Review, Synthesis, and Descriptions

Each researcher independently reviewed each article and then created an individual table. Following the review of all articles, the researchers met to achieve consensus on article content, result, and descriptions. At this point, the researchers also discussed potential study implications and elements important to report in discussion and synthesis of the literature. For this scoping review, the researchers met one final time to review and summarize the literature. To inform future research embedding drumming approaches, the authors reflected on a summary of approaches.

Results

The data table summarizing the studies contained practical components of location, methodology, and participants, as well as more esoteric points, such as level of evidence and outcome measure selected. A description of each study (n =17) is detailed in Table 2 (see Appendix).

Demographic Information

In terms of study location, nine studies were conducted in the United States (Berger, 2012; Fitzpatrick et al., 2017; Litchke & Bracken, 2018; Litchke et al., 2019; Litchke et al., 2021; Litchke & Hutson, 2021; Smith et al., 2019; Willemin et al., 2018; Yang et al., 2021). One study was conducted in both the US and UK (Gesualdo et al., 2020). Of the remaining studies, two were conducted in Canada (Finnigan & Starr, 2010; Locke & Clark, 2009), one in Malaysia (Kaur & Alias, 2021), one in Italy (Boso et al., 2007), one in Germany (Ekins et al., 2019), one in Korea (Yoo & Kim, 2018), and one in the UK (Lowry et al., 2019). All studies were published between 2007 and 2021, with 11 of the 17 studies published just in the past 5 years (2018–2021), indicating increased interest in TD in the research community.

Participants included in these studies represented a wide range of ages, demographics, and clinical settings. The studies yielded 804 participants, with sample size ranging from 1 (a single case-study design) to 397. Eleven studies expressly identified autistic participants in their titles (Berger, 2012; Boso et al., 2007; Finnigan & Starr, 2010; Fitzpatrick et al., 2017; Kaur & Alias, 2021; Litchke & Bracken, 2018; Litchke et al., 2019; Smith et al., 2019; Willemin et al., 2018; Yang et al., 2021; Yoo & Kim, 2018). All seventeen studies included autistic participants. Mental health, social-emotional ability, and/or social skills were mentioned in the title, as well as operationally focused on in eight studies (Litchke & Bracken, 2018; Litchke et al., 2019; Litchke et al., 2021; Litchke & Hutson, 2021; Locke & Clark, 2009; Lowry et al., 2019; Willemin et al., 2018; Yoo & Kim, 2018). In the included studies, the participants ranged from 3 to 55 years of age. The studies spanned the home environment, school-based settings, summer camps, musical clinics, and research labs. In two of the studies, drumming was used to understand differences in motor, sensory, and social development between neurodivergent and neurotypical people (Fitzpatrick et al., 2017; Yoo & Kim, 2018).

TD intervention length and specified style of drumming varied with each study. As far as treatment length, the studies ranged from one session (Litchke & Hutson, 2021) to a full year of intervention (Boso et al., 2007; Gesualdo et al., 2020; Smith et al., 2019). The majority of interventions took place over 4 to 8 weeks, where TD activities were engaged in one, two, or three times per week, for a range of 25 through 60 min per session (Berger, 2012; Ekins et al., 2019; Gesualdo et al., 2020; Kaur & Alias, 2021; Litchke & Bracken, 2018; Litchke et al., 2019; Litchke et al., 2021; Lowry et al., 2019; Willemin et al., 2018; Yang et al., 2021). For drumming materials and curricula, researchers selected specified approaches, including Drums Alive/Drumtastic (Ekins et al., 2019; Litchke & Bracken, 2018; Litchke et al., 2019; Litchke et al., 2021; Litchke & Hutson, 2021; Willemin et al., 2018; Yang et al., 2021), Rhythm Arts/TRAP project (Smith et al., 2019), Sounds of Intent (SOI) approach (Kaur & Alias, 2021), Rock drumming (Lowry et al., 2018), African drumming (Locke & Clark, 2009), and an eclectic or unspecified TD style (Berger, 2012; Boso et al., 2007; Finnigan & Starr, 2010; Gesualdo et al., 2020). As far as drumming circle/dyadic drumming facilitators, the studies incorporated a variety of trained/certified staff, including therapeutic recreation professionals, researchers, and graduate students (Litchke & Bracken, 2018; Litchke et al., 2019; Litchke et al., 2021; Willemin et al., 2018); music therapists (Boso et al., 2007); summer camp staff (Litchke & Hutson, 2021); and teachers and educators trained in drumming approaches (Locke & Clark, 2009). Furthermore, while TD was the focus of the included studies, a careful review revealed that while rhythm-based intervention used TD as a primary modality, it often incorporated other music and movement modalities in addition to TD in the same session (Gonzalez, 2015; Litchke & Hutson, 2021).

A wide variety of measurement tools were used across the motor, emotional, social, and general developmental domains (e.g., MABC-2, PEDI-CAT, BOT-2), as well as mental-health-related assessments (e.g., SDQ, PANAS-C, HADS) (Litchke et al., 2021; Lowry et al., 2019; Smith et al., 2019). Of the 17 studies, 14 specifically described a pre and post test assessment before and subsequent to drumming intervention (Berger, 2012; Boso et al., 2007; Ekins et al., 2019; Finnigan & Starr, 2010; Gesualdo et al., 2020; Kaur & Alias, 2021; Litchke et al., 2019; Litchke et al., 2021; Litchke & Hutson, 2021; Locke & Clark, 2009; Lowry et al., 2019; Smith et al., 2019; Willemin et al., 2018; Yang et al., 2021). The remaining three consisted of either phenotyping/developmental differentiation (Fitzpatrick et al., 2017; Yoo & Kim, 2018) or qualitative/anecdotal measures of growth (Litchke & Bracken, 2018). Several studies included a mixed-method component, with both quantitative and qualitative data collected (Kaur & Alias, 2021; Locke & Clark, 2009; Lowry et al., 2019). In one study, the mental health impacts on the drumming circle facilitators rather than the participants were subject to functional analysis (Litchke et al., 2019). While participants in the majority of the studies reported enjoyment in therapeutic activities, statistically significant improvements in functional skills were reported in nine studies of the 14 pre/post test-pattern studies (Berger, 2012; Boso et al., 2007; Ekins et al., 2019; Finnigan & Starr, 2010; Gesualdo et al., 2020; Kaur & Alias, 2021; Litchke et al., 2019; Litchke et al., 2021; Smith et al., 2019). Specified assessment tools used can be seen in Table 2. On analysis, three themes emerged in the review, each of which is subsequently expanded on below: Universality of Drumming Techniques, Inconsistency of Instrumentation/Measurement, and Lack of Research.

Universality of Drumming Techniques

A careful review of the seventeen studies revealed synchrony in the delivery of a drumming circle, dyadic drumming, or individual drumming session (Litchke et al., 2021; James et al., 2015). This synchrony consistently appeared throughout the literature independent of location, participant age, professional field of facilitator(s), specified instruments, or size of group. A TD experience had a certain repeatable pattern to the session: introduction/warm-up, central or main component, and closure (Ekins et al., 2019; Kaur & Alias, 2021; Plastow et al., 2018; Smith et al., 2019). The drumming sessions ranged from 25 to 60 min, and each component may take longer or shorter depending on the approach, participant age, group size, and practical allotment (Amonkar et al., 2021). Yet, the cadence, the sequence, the ebb and flow, and even, for the most part, the marked similarity of materials indicated that despite varied geographic areas and professions, there was marked near-universal symmetry of approaches (Durojaye, 2017). In the studies reviewed, the following sequence was described over and over: drums/materials are introduced slowly and intentionally, followed by interaction between participants/materials in the central/main component, and ending with group closure/structured finish (Litchke et al., 2021; Plastow et al., 2018). The consistency of the TD approach seemed to be organic rather than intentional coordination of international drumming facilitators. Ultimately, the commonality from a methodological standpoint appeared to be a necessary pre-implementation training that each TD facilitator reported, potentially contributing to the consistency and similarity of TD sessions across studies. While the pre-implementation training varied in length and content between studies, the need to specifically train as a facilitator of the designated rhythm intervention was evidenced across studies.

Inconsistency of Instrumentation/Measurement (With an Exception)

In contrast to the consistency of TD intervention content, instrumentation of measurement tools for outcomes lacked consistency. In the seventeen studies in the scoping review, over 25 data collection tools were used to measure pre and post skills of participants vis a vis the drumming intervention (Berger,

2012; Boso et al., 2007; Ekins et al., 2019; Finnigan & Starr, 2010; Gesualdo et al., 2020; Kaur & Alias, 2021; Litchke et al., 2019; Litchke et al., 2021; Litchke & Hutson, 2021; Locke & Clark, 2009; Lowry et al., 2019; Smith et al., 2019; Willemin et al., 2018; Yang et al., 2021). Moreover, it was not simply the instrument itself that varied; the variables measured pre and post intervention were also diverse, evidencing the wide variety of outcomes addressed by TD. Some studies embedded motor pre and post components, though motor may have been tested via a standardized instrument, such as the Bruininks-Oseretsky Test of Motor Proficiency-2 (BOT-2), or a researcher-developed Likert scale (Boso et al., 2007; Gesualdo et al., 2020; Yang et al., 2021). Some studies operationalized the construct of social-emotional skills through the psychosocial component, while others observed several distinct social skills via video recording (Litchke et al., 2021; Kaur & Alias, 2021). Still, in other studies, an observational-qualitative approach was used to understand experiences without quantitative data collection to ascertain effectiveness (Litchke & Bracken, 2018).

Lack of Research

There appeared to be a great need for rigorous, well-designed research to understand if and how TD can improve the well-being of autistic people within the scope of occupational therapy practice (Amonkar et al., 2021; Lowry et al., 2019; Plastow et al., 2018; Willemin et al., 2018). TD is conceptually related to similar interventions commonly used by occupational therapists, such as yoga, music/movement, metronome, and dance. The group/dyadic aspect of TD is worthy of continued study as a mechanism to support the occupation of social participation across the lifespan of autistic individuals (AOTA, 2020; Yoo & Kim, 2018). As stated, the uniformity or similarity of drumming approaches, in terms of how the sessions and interventions are designed, was not found in the mechanism for the effectiveness of drumming interventions, given the wide variety of data collection tools and methods (Fitzpatrick et al., 2017; Locke & Clark, 2009; Smith et al., 2019). There were, in fact, very few studies across the globe focusing specifically on TD; there were even fewer studies intentionally focused on TD in the autistic population (James et al., 2015). Furthermore, certain studies, including a TD approach specifically designed for autistic people, clear definitions, and precise instrumentation, were not well-studied with regard to drumming (Litchke et al., 2021; Lowry et al., 2019; Willemin et al., 2018). This indicates the need for a more rigorous approach in TD research to improve understanding of the mechanisms by which drumming can be used successfully with this population for the express purpose of affecting gains to mental health and well-being.

Discussion

This scoping review canvassed existing literature on TD to improve and support mental health and well-being in the autistic population. This section will summarize the findings of this review by describing existing literature and the therapeutic potentiality of drumming in the occupational therapy domain to improve the mental health and well-being of autistic people (Plastow et al., 2018). The majority of published studies on TD included data collection tools covering motor and sensory function, as well as social and mental health for autistic individuals (Amonkar et al., 2021; James et al., 2015; Marquez-Garcia et al., 2021). This research provided a broad overview of past TD methodologies as a means to improve understanding of effective mechanisms for future interventions, intentionally focused on the mental health and well-being of autistic populations.

As reported, a high level of consistency was found in the delivery of TD interventions for the mental health of autistic people from around the globe. Perhaps the universality stemmed from some embedded, deeper understanding of humanity, particularly autism, where the developmental triad of

motor, sensory, and social skill streams intersect to promote or hinder growth (Berger, 2012). While the intervention itself was remarkably similar across widespread geographic areas, little consistency appeared in the literature with regard to data collection, study design, or instrumentation. Still, there was one noteworthy component of the data collection that was consistently found in the literature: a high level of social validity of drumming interventions, spanning continents, ages, diagnosis, facilitator and participant, profession, and approach (Berger, 2012; Boso et al., 2007; Ekins et al., 2019; Finnigan & Starr, 2010; Gesualdo et al., 2020; Kaur & Alias, 2021; Litchke et al., 2019; Litchke et al., 2021; Litchke & Hutson, 2021; Locke & Clark, 2009; Lowry et al., 2019; Smith et al., 2019; Willemin et al., 2018; Yang et al., 2021). In the 17 studies and across the TD literature-at-large, participants repeatedly expressed a sense of joy during and after the sessions, a finding that aligns with core practices at the heart of holistic, client-centered, and neurodiversity-affirming occupational therapy approaches (AOTA, 2020; Litchke et al., 2021; Plastow et al., 2018). The Fun-o-Meter was an example of a social-validity data collection tool aimed at ascertaining participant enjoyment or sense of engagement (Litchke & Hutson, 2021). For this scoping review, it is of particular importance that drumming had high social validity as a component of neurodiversity-affirming practice. For neurodiverse individuals across the literature and lifespan, drumming met the criteria of an enjoyable, meaningful, and restorative activity (AOTA, 2020).

Finally, in the occupational therapy literature, there existed little research on the therapeutic potential of drumming techniques targeted at improving the mental health of autistic people of a variety of ages. Autistic individuals typically receive an influx of therapeutic and support services, including occupational therapy and, earlier on in life, pediatric care. However, few autistic people continue to access these services into adulthood (Benevides et al., 2022). This scoping review included some specific, though few, studies where autistic participants from a wide range of ages (including those well into their 50s) benefitted from TD approaches (Gesualdo et al., 2020). Therefore, the potentiality for future study within the scope of occupational therapy, in particular for autistic clients who tend to access occupational therapy services progressively infrequently as they age, is compelling (Kornblau & Robertson, 2021). In all, given the social validity, meaningfulness, and therapeutic nature of drumming throughout the lifespan, this approach is well-aligned with the unique contributions occupational therapists aim for in improving and supporting the mental health and well-being of autistic people (AOTA, 2020; Benevides et al., 2022).

Limitations

To gather available data on using drumming interventions to improve the mental health and well-being of autistic people, we determined that a scoping view was a fitting choice, as a lack of available research necessitated casting the widest net possible. The scoping review resulted in 17 studies meeting the inclusionary criteria from outside the occupational therapy literature to inform future TD intervention and study implementation in occupational therapy practice. At the same time, because of the diversity of outcome measures, as well as poor consensus on the instrumentation of mental health and well-being improvements across the board, this review did not reveal a cohesive number for statistical significance or effect size. In addition, because of the specificity of the topic, this review was not restricted to studies with only autistic clients; however, all studies included some autistic clients as well as neurotypical peers and those with varying other conditions or difficulties. Though the included studies were not restricted by date, the search yielded 17 research studies since 2007 that were deemed relevant to answer the question posed.

Implications for Occupational Therapy Practice

This study has several implications for occupational therapists who work with autistic individuals throughout the lifespan. Firstly, drumming interventions have strong social validity in the autistic population, indicating its potential for implementation as a therapeutic activity (Litchke et al., 2021; Litchke & Hutson, 2021; Lowry et al., 2019; Plastow et al., 2018). Secondly, there is a clear need for more research on drumming interventions originating from the occupational therapy literature, specifically for autistic individuals (Kornblau & Robertson, 2021; Plastow et al., 2018). Thirdly, when designing these interventions, there is a need for a consistent understanding of the instrumentation for the purpose of measuring mental health and well-being improvements, with the potential to use existing or design new instruments.

Finally, intentionally using the unique lens of occupational therapy to design TD activities for autistic individuals throughout the lifespan have tremendous potential for occupational therapy practice (AOTA, 2020; Benevides et al., 2022). The specialized skill set of occupational therapists can allow for activity analysis of individual and group-based TD approaches for neurodivergent people, embedding those approaches for a focus on health, well-being, and participation (AOTA, 2020; Yoo & Kim, 2018). For students training to become occupational therapists, embedding TD into service-learning components of curricula can positively impact the mental health of both student facilitators and autistic clients (Litchke et al., 2019). Furthermore, methodological analysis in this scoping review revealed an intentional pre-study training period for drumming facilitators, preparing these therapists to carry out TD interventions with fidelity and consistency (Litchke & Bracken, 2018). Therefore, for occupational therapy students or therapists seeking to implement TD interventions, it may be necessary to allot time toward preparation and training specifically in the TD intervention selected before implementation.

Conclusion

This scoping review provided a broad examination of available literature on TD used in the autistic population to improve well-being. Past research contributions on TD interventions outside of the occupational therapy literature can inform future studies of the implementation of drumming within the scope of occupational therapy practice to promote occupational performance. When viewed through the lens of occupation, engagement in a TD circle may be categorized as social participation, health management, education, leisure, and/or play (AOTA, 2020).

Sound research may also expand the options of neurodivergent-affirming interventions available to autistic individuals. An autistic person engaging in a TD intervention may value this activity as a meaningful occupation (AOTA, 2020). Based on available evidence, TD interventions show the potential to be well-matched to the mental health and well-being needs of autistic clients while additionally addressing the aforementioned motor, social-emotional, and sensory challenges (Boso et al., 2007; Yoo & Kim, 2018). TD is a natural fit with the tenets of neurodivergent-affirming practice, as it would employ the autistic individuals' or groups' interests, strengths, and creativity to maximize their participation (Dallman et al., 2022). It is important to continue to explore and implement high-fidelity TD interventions within the scope of occupational therapy with strong instrumentation to measure well-being as a means to serve autistic clients throughout the lifespan. Furthermore, as a society committed to growth, it is essential that this research include and empower the voices of these autistic clients, highlighting their preferences, interests, and experiences.

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Appendix

Table 2
Scoping Review Summary Chart

#	Author/Year/Location	Participant Sample (n, ages, dx)	Treatment Design (#/length sessions, drum tx method)	Data/Measurements (pre/post, study methodology)	Results/Outcomes
1	Berger, D. S. (2012), Rhode Island, US	N = 6 subjects with ASD diagnosis, male/female, 8–12 years of age, low/mod autism range.	Individual intervention, 8 weeks, 45-min sessions once per week, four discrete tempo-specific tasks 60 beats per minute, embedded in sessions, drumming, clapping, cymbals.	Level 3B, pre/post comparison on unique 5-point behavioral observation rating scale and Lifeshirt heart-monitor vest to track heart rate through sessions.	Hand tapping and drumming most likely to yield entrainment, consistent entrained heart rate at level of “controlled arousal,” gains of between 1%–12% behavioral imitations. “In all, there is an indication of gain in the ability to execute each of the four interventions presented in the study.”
2	Boso et al. (2007), Italy	n = 8 young adults with diagnosed autism, per Childhood Autism Rating Scale/Structured Clinical Interview per Axis I DSM-IV, seven males, one female, ranging from 23–38 years of age.	1-hr groups, 52 weeks, including singing, piano playing, and drumming, two music therapists ran the sessions, electronic keyboard, piano, and drums.	Level 3B, Pre-Mid-Post test comparison on Clinical Global Impression (CGI) scale and Brief Psychiatric Rating Scale (BPRS), Musical Skills Questionnaire scored on Likert scale at 0/26/52 weeks.	Significant improvements in CGI, BPRS, and musical skills, “current study provides preliminary evidence demonstrating the beneficial action of long-term active music therapy in a group of young adults with severe autism. Because music seemed to be of clinical usefulness for certain core domains of autism, a randomized controlled trial of long-term music therapy in autism is warranted.”
3	Ekins et al. (2019), Germany	n = 15 children 13.9 ± 2.7 years of age, four females and 11 males, several with comorbid diagnoses, including autism, intervention group (IG) (n = 10), and control group (CG) (n = 5).	CG receive traditional physical education 3x per week, IG received Drums Alive intervention 2x per week and two PE per week.	Level 2B, Control-comparison study, Heidelberg Competency Inventory (HKI), Behavior Questionnaire for Developmental Disabilities (VFL-L), the Developmental Behavior Checklist (DBC-M), German Motor Skill Test.	Based on statistically significant improvements of IG at post test on DBC-M checklist, Drums Alive intervention can improve cognitive, social, emotional, educational, and self-actualization needs of clients with autism.
4	Finnigan, E., & Starr, E. (2010), Ontario, Canada	n = 1 single subject, 3.8 years of age, preschool female with autism diagnosed – Module 1, Childhood Autism Rating Scale (CARS), Vineland Adaptive Behaviour Scales –	Single subject, alternating treatment design, Phase A (baseline), Phase B (music alternating with non music), Phase C (music combined with non music), Phase D (follow up).	Level 4, Rating Scale for Child Affect (Interest and Happiness) and General Behaviour, as well as blind-rater behavior tracking/tallying of three target behaviors: eye contact, motor imitation, and turn-taking.	Improved observed level of happiness during music intervention components (seen in Phases B–D) as well as statistically significant increases in socially significant behaviors of eye contact, motor imitation, and turn-

second edition,
Mullen Scales of
Early Learning.

taking.
“Current study serves as
one contribution to this
literature and
demonstrates the
potential of music
therapy for increasing
social responsive
behaviour.”

#	Author/Year/Location	Participant Sample (n, ages, dx)	Treatment Design (#/length sessions, drum tx method)	Data/Measurements (pre/post, study methodology)	Results/Outcomes
5	Fitzpatrick et al. (2017), US	N = 98 children, 6-10 years of age, 45 autism group, 53 control group, ADOS-2 used to confirm autism diagnosis per criteria.	Participants met with researchers on two occasions, drumming used to differentiate between autism and control group in terms of Social Motor Synchronization Tasks, Social Cognitive Behavior Tasks, and Motor Control Tasks.	Level 2B (non intervention) 1st visit- clinical phenotyping via Clinical Evaluation of Language Fundamentals-4 (CELF 4) and Differential Abilities Scales, 2nd edition (DAS-II), parents completed Social Responsive- ness Scale (SRS), Achenbach Child Behavior Checklist (CBCL), 2nd visit- Social Motor Synchronization Tasks, Social Cognitive Behavior, and motor control tasks.	Social Motor Synchronization closely related to social cognition, varies with ASD severity, “further research that relies on objective dynamical measures of social motor synchronization and perceptual and motor processes is needed . . . Research is needed to determine whether social synchronization interventions can improve social skills in children with ASD as well as provide insights to aid clinical diagnosis and prognosis of ASD.”
6	Gesualdo et al. (2020), U.K. and US	n = 2, n = 4, n = 3, three studies: (a) two adolescent 15-year-old males with disabilities in U.K. (b) four male adults 30–55 years of age, various disabilities, including autism, (c) three males 9–14 years of age, dyslexia/ADD.	Study 1:6 months, 30 min drumming sessions per week, Study 2:4 weeks of 30 min. drumming group, follow up 4 months later, Study 3:30 min/week cognitive drumming, teaching strategies for a year.	Level 4, improvement in metronome entrainment/rhythmic follow-through.	“The authors investigated how cognitive drumming developed coordination, improved retention, and social skill interactions, and improved physical and cognitive functioning.” Silent practice on drum set with pad showed greater promise for clinical improvement, implication for future studies.

#	Author/Year/Location	Participant Sample (n, ages, dx)	Treatment Design (#/length sessions, drum tx method)	Data/Measurements (pre/post, study methodology)	Results/Outcomes
7	Kaur & Alias (2021), Malay-sia	n = 4 male students with autism 5 to 7 years of age, purposive sampling, attended autism center.	6 weeks, 3x per week for 30 min each session, Sounds of Intent (SOI) method- musical program intentionally designed for people with special needs, five novel instruments embedded in Circle Time approach: singing nursery rhymes with bells, egg shakers, tambourines, small drums with drumsticks, and maracas.	Level 3B, multiple case study design, proactive musical engagement level measured, each session video-recorded, triangulation of data achieved by combination of data mining of prior student information, review of student communication books, and careful observations to obtain SOI-driven Proactive Musical Engagement Measures.	“Using percussion instruments in the classroom enhance the proactive musical engagement of children with autism.” Also noted was connection between types of music/tempos and mood observed in each child, as well as specific child sensory preferences or aversions to specified instruments.
8	Litchke & Bracken(2018), US	n = 14 male summer campers with a primary diagnosis of autism (seven Caucasian, seven Hispanic), ranging from 5–14 years of age, paired with 14 graduate students (GS) each of whom took extensive field notes.	Drumtastic Ability Beats Drumming groups provided for 4 weeks of camp, twice per week, 1 hr per session (8 hr), PI was certified Drumtastic Trainer and recreation specialist, 11 sequential activities including percussion/ movement components centered around a bucket/large stability/ therapy ball/drum sticks, singing, yoga embedded.	Qualitative descriptive methodology, PI trained the 14 GS in structured narrative note taking, capturing subjective/objective observations of participant social, emotional, and physical function throughout the 1 hr-long Drumtastic groups.	Field notes revealed three themes, outlining mental health improvements of participants: (a) familiarization through synchronization, (b) creative self-expression, and (c) self-regulation of emotions. The ability to synchronize movements, as a means to connecting to one’s creative self, allowed for greater self-regulation observed over the 4-week period by GS.
9	Litchke et al. (2019), US	N = 19 undergraduate and graduate college students paired with a child with ASD as a drumming partner.	4-week summer camp Drumtastic Dyadic drumming service learning experience, 2x per week sessions for 1 hr each (8 hr), approach consisted of multi-modular protocols that combined physical education, fitness, drumming, music education, mindfulness, and relaxation strategies.	Level 3B, quasi-experimental, participants completed Hospital Anxiety and Depression Scale (HADS), Perceived Stress Scale (PSS), Connor Davis Resilience Scale (CDR), Physical Activity Enjoyment Scale (PACES), and final reflective writing completion.	Group drumming resulted in reduced stress, reduced anxiety, improved social resilience, and perceived increase in joy following participation in drumming circles as a service-learning project. This study is significant as it demonstrates improved mental health strongly connected to drumming participation. This study highlights the potential of drumming to initiate reciprocal mental health improvement of both drum circle guides and participants while embedded in a service learning approach.

Therapeutic Drumming: A Scoping Review

#	Author/Year/Location	Participant Sample (n, ages, dx)	Treatment Design (#/length sessions, drum tx method)	Data/Measurements (pre/post, study methodology)	Results/Outcomes
10	Litchke et al. (2021), US	n = 29, 3- and 4-year-old early childhood students with a diagnosis of autism, divided into three groups, Kid Yoga Rocks (KYR) (n = 10), Drumtastic (DR) (n = 11), and Recess/control group (n = 8)	2x per week, 5 weeks, 10 sessions provided, first six sessions 30 min each, sessions 7–10 1-hr duration, Drumtastic, yoga and recess/classroom gym activities depending on randomly assigned participatory group.	Level 2B, Case-Control Study, (a) Fun-o-Meter (FOMS), facilitator rate perceived participant mood/fun following each group, (b) PANAS-C (Positive and Negative Affect Scale-Child version), (3) Social Personal Relationship Scale (SPRS) completed by PI participating therapeutic recreation (TR) students and/or classroom teacher.	Both KYR and DR groups demonstrated improvements in FOMS, PANAS-C, SPRS in relation to the control group, with additional social-emotional improvements per SPRS noted in DR group, indicating potential value of drumming with regard to socialization and mental health.
11	Litchke & Hutson (2021), US	N = 397 students ranging 5–49 years of age, n = 144 autistic clients who participated (mean age = 17.67).	One, 1-hr session of Drumtastic Ability Beats (DAB) as part of a summer camp activity, groups of 5–6 campers per session, large exercise ball drumming.	Level 3B, quasi-experimental, (a) Fun-o-Meter (FOMS), clients rated their own mood/fun based on self-perception following each group, (b) PANAS-C (Positive and Negative Affect Scale-Child version), (c) Social Personal Relationship Scale (SPRS) completed by each client's 1:1 summer counselor.	Positive effect on perception of fun and social emotional function of campers noted. Age did not appear to be a factor, as drumming revealed similar effects across the varied ages and diagnoses represented here. Decreased significance of effects in ASD group.
12	Locke & Clark (2009), Canada	n = 80 kindergarten students in a self-contained school participated in the study, 40 in intervention group, 40 in control group, typical diagnoses in this school included autism, Down's Syndrome, and severe developmental delays.	Weekly Friday, 25-min long sessions provided for 4 months using an African drumming technique provided by an expert facilitator and/or colleague trained by the facilitator.	Qualitative phenomenological approach, operationalized definitions of attention, engagement, and aggression were shared among PI, co-PI, and school-based staff. Data consisted of responses of focus groups, recorded sessions, anecdotal journals, and in-depth interviews, behavioral checklists used to corroborate results quantitatively.	Children demonstrated improved engagement, affect, excitement, and motivation following participation in the 4-month experience, per reports from parents and teachers. Behavioral checklists did not reveal conclusive results.

#	Author/Year/Location	Participant Sample (n, ages, dx)	Treatment Design (#/length sessions, drum tx method)	Data/Measurements (pre/post, study methodology)	Results/Outcomes
13	Lowry et al. (2019), England	N = 18 children 7 and 8 years of age from inclusion elementary school, 12 children received drumming, six children with emotional and behavioral difficulties, drum group, six typically developing peers, peer drum, six children, three EBD, and three peers, did not receive, drumming as control group.	2, 30-min sessions per week, for 5 weeks (10 sessions, 5 hr drumming intervention), Rock Drumming Group included 16 drumming tasks sequenced for complexity.	Level 2B, mixed methods study: MABC-2 Movement Assessment Battery for Children-2 used to measure fine and gross motor skills, SDQ Strengths and Difficulties Questionnaire used to measure social- emotional ability pre and post, specified drumming behaviors scored pre and post, qualitative analysis of staff interviews to reveal perceptions and experiences of staff re: drumming intervention.	Refinement of measures is necessary to ascertain effects of drumming intervention. Staff interviews revealed perceptions of positive effects for children who participated, in terms of social, emotional, mental, and motor development. Need for replication studies with larger sample sizes and consistent instrumentation to document effects of drumming.
14	Smith et al. (2019), US	n = 23 children with autism, grades 6–12 (middle- and high-school).	Rhythm Arts Project (TRAP) multi-sensory rhythmic-drumming approach, year-long school-based intervention, 2x per week	Level 3B, quasi-experimental pre and post test on PEDI-CAT, pre consisted of repeated baseline measure in previous June and at start of school year, followed by full-year participation in TRAP, followed by post test in subsequent June.	Statistically significant improvements across domains of PEDI-CAT, including mobility status, daily activity, cognitive and social skills, and responsibility. TRAP embedded teaching strategies with evidence of effectiveness for autistic people include: modeling, prompting, and visual supports, while skills embedded include self-awareness, attending skills, socialization, turn taking, verbalization, memory, differentiation, sequencing, patterning, temporal organization, motor control, motor rhythm, and laterality.
15	Willemin et al. (2018), US	n = 14 children diagnosed with autism, ranging from 5-14 years of age.	Drumtastic approach, two, 60-min sessions per week for 4 weeks of summer camp for children with autism, therapeutic recreation students completed implementation/data collection, seven sequenced sections involving music, ball, drum equipment, and cue cards, yoga toward end of each group.	Level 3B, quasi-experimental, Fun-o-Meter and Smiley-o-Meter for participant perception outcomes, PANAS-C (Positive and Negative Affect Scale-Child version) completed by parent, and Social Personal Relationship Scale (SPRS).	Zones of Proximal Development theory per Vygotsky, used to describe social learning and gains exhibited in dyadic and group drumming opportunities across Fun-o-Meter and Smiley-o-Meter. Lack of significant results reported in PANAS and SPRS. Implications include more careful look at instrumentation and connection of data collection to components addressed in the intervention.

Therapeutic Drumming: A Scoping Review

#	Author/Year/Location	Participant Sample (n, ages, dx)	Treatment Design (#/length sessions, drum tx method)	Data/Measurements (pre/post, study methodology)	Results/Outcomes
16	Yang et al. (2021)	N = 9, n = 5 with autism and n = 4 with intellectual disabilities, 17–20 years of age.	Drums Alive approach, 2x per week, 1 hr per session, for 8 weeks (16 hours). PI completed all intervention sessions.	Level 3B, quasi-experimental, paired-sample <i>t</i> -test, (a) motor skills assessed by Bruininks-Oseretsky Test of Motor Proficiency (2nd ed.), (BOT-2) short form (b) Attention assessed by Moss Attention Rating Scale (MARS), (c) Behavior assessed by revised Achenbach System of Empirically Based Assessment-Children Behavior Checklist (CBCL) for 6 – 18 years of age.	No statistically significant differences on BOT-2 short form, MARS, or CBCL. May be due to small sample size, length of intervention, or instrumentation. Participants expressed enjoyment of Drums Alive and greater attention to task following. Implications for study include longer interventions and better instrumentation matched to intervention. Also important to directly address the enjoyment, social skills, and motivation aspects, not well addressed with instruments selected.
17	Yoo & Kim (2018), Korea	n = 52, n = 9, two studies: first study: .52 children, 11–16 years of age, 42 typically developing, 10 with diagnosis of autism per DSM IV, second study: n = 8 children with autism.	First study: correlational testing to assess relationship between dyadic drum playing skill and social skills performance on electronic drum pad, second study: eight, 30 min individual sessions provided to each participant focusing on engagement, interpersonal coordination, and adaptive adjustment.	Level 2B (1st), Level 3B (2nd), First study: K-WISC-IV for intelligence, Korean-Social Skills Rating System (K-SSRS), social skills school-based measure, unique 20-item imitation task, 35 emotion-identification pictures from Karolinska Directed Emotional Faces (KDEF) and Electronic Drum Tapping Tasks, second study: K-SSRS for social domain, Drum Tapping Tasks for dyadic drum skills, video record sessions 2, 4, 6, 8.	First study: dyadic drum playing with tempo adjustment and rhythmic cueing was associated with improved social skills in terms of embodied intersubjectivity, motor representation, and anticipatory adjustment. Self-regulation was found to be an important foundational skill indicating the need to address this prior to social interaction for people with autism. Also, slower rhythmic movements were more challenging to produce synchronously for people with ASD. Second study: greater engagement, coordination, and adaptive adjustment found following eight sessions. Implications include (a) need to tailor interventions to mild-autism clients, with more targeted approach, (b) need for group/peer driven drumming interventions, (c) need for research to connect drumming interventions to social-emotional function of people with autism.