ARTICLE

ABSTRACT

Background: Reports of drummers’ dystonia are rare, particularly compared to the literature on dystonia in string, piano and brass players. Several cases of drummers’ dystonia have been included in large series of multiple instrumentalists, but there are few reports comprised exclusively of drummers with musicians’ dystonia. We present here a series of 12 drummers with task-specific, focal dystonia affecting their upper limbs while drumming and spanning multiple playing techniques and musical styles.

Methods: We conducted a retrospective chart review of drummers with dystonia seen at academic Movement Disorders centers.

Results: All 12 patients were male, and the majority eventually developed spread of dystonia to tasks other than drumming. Ten of the 12 had dystonia affecting their fingers, while 8/12 had dystonia affecting the wrist. Only 1/12 had involvement proximal to the wrist. Pharmacologic interventions were largely ineffective; 3 had some benefit from botulinum toxin injections, but this was limited by problematic weakness in one drummer.

Discussion: The phenomenology in our series is concordant with prior reported cases, demonstrating frequent wrist involvement, though we also found that a greater proportion of patients had dystonia affecting the fingers. It could be hypothesized that different drumming techniques or musical styles modulate the relative risk of dystonic involvement of the different anatomical regions of the upper limb.

Highlights: Drummers’ dystonia is one of the least common forms of musicians’ dystonia, though this may reflect fewer numbers of these instrumentalists. We present the largest series of drummers’ dystonia and review previously published cases. Our cohort, representing diverse drumming styles, showed frequent involvement of dystonia in the wrists and fingers.
INTRODUCTION

Musicians’ dystonia is a particularly disabling form of occupational, task-specific focal hand dystonia and can be a career-ending disorder for professional musicians. It typically presents as a sustained twisting, tremor, or loss of coordination while playing an instrument. Musicians’ dystonia is estimated to affect 1% of professional musicians, but can affect amateurs and students as well [1]. The region of the body that is most commonly affected varies by instrument type but is often localized to the area of the body or limb producing the most rapid and highly skilled movements. This is reflected in more frequent involvement of the left hand in bowed string players, right hand in keyboard players, and embouchure in brass players [2].

Although drummers’ dystonia has been previously reported, it is relatively rare in the literature, particularly in comparison to reports in other types of musicians. Several cases affecting drummers have been included in large series of multiple instrumentalists, but there are few reports comprised exclusively of drummers. Out of all instrumentalists seen in performing arts clinics for focal dystonia, as reported in 4 large case series, only 1–5% were percussionists [3–6]. Drummers’ dystonia has been reported most frequently to affect the upper limbs, but recent case reports describe lower limb dystonia in drummers using pedals [7–9]. The largest published series of drummers’ dystonia to date included 6 drummers [6]. Here, we present a series of 12 drummers with focal hand dystonia seen in Movement Disorders clinics at academic medical centers and describe the clinical features of the drummers, the phenomenology of their dystonia, and compare with prior reports in the literature.

METHODS

This study was a retrospective chart review of drummers’ dystonia seen at academic medical centers (Columbia University Medical Center/Mount Sinai Health System [S.J.F.], Rush University Medical Center [J.G.G., I.O.B.], University of Maryland Medical Center [S.G.R.], University of California, San Francisco [I.O.B.]). The variables ascertained from the patient charts and videos were established a priori by the investigators. These variables included the age at which drumming was first started, instruments and musical styles played, age at development of dystonic symptoms, phenomenological features of dystonia, exacerbating and ameliorating factors, events prior to development of dystonic symptoms, and interventions tried. Descriptive statistics were used to describe the demographic and clinical features of the drummers in the cohort.

RESULTS

DESCRIPTION OF COHORT (TABLE 1)

All 12 patients with drummers’ dystonia were male. Mean age of dystonia onset was 35.2 ± 10 years, spanning a range of 19 to 53 years. The mean time from symptom onset to diagnosis was 4.1 ± 2.78 years. Nearly all drummers experienced marked professional impairment. Two patients changed careers from musical performance to non-performance focuses, including music education and composition. Information regarding style of music played was obtained in 9 drummers: three were primarily classical percussionists, two played traditional Indian tabla, one played jazz and rock, one played pop, one played African-Cuban and African-Caribbean drums, and two played multiple styles. Information regarding age at which the instrument was first started was available for 7 drummers, with a mean age of 11.8 ± 6.7 years, and a range of 2.5–24 years. Only one drummer, who had a father with writer’s cramp, reported a family history of dystonia. None of the patients in our cohort had genetic testing for variants in dystonia associated genes.

CLINICAL FEATURES

Only upper limbs were involved in our cohort of drummers: six had left upper limb involvement, five had right upper limb involvement, and one had bilateral involvement. Wrist involvement alone was reported in two patients, and isolated finger involvement in four. Six patients had combined finger and wrist dystonia during drumming. Only one drummer had involvement of any arm region proximal to the wrist, with involuntary shoulder elevation in conjunction with wrist and finger posturing. The pattern of involuntary finger movements was divided between flexion in some drummers and extension in others, though two had a pattern of combined distal finger extension and proximal flexion at the metacarpophalangeal joints. One of the drummers experienced irregular tremor in the left upper extremity when playing with very slow strokes; tremor consisted of irregular flexion/extension movements of the wrist at times intermixed with forearm pronation/supination. Four drummers experienced tremor in their affected hand when engaged in tasks other than drumming.

Four drummers identified specific musical patterns or settings in which the dystonia was most intrusive or severe. For one drummer, this included a single roll, as opposed to double roll strokes. Another patient, a classical Indian tabla player, found that the strokes involving his right index finger were the most difficult to execute, but was able to continue to play passages using the wrist without difficulty. Another patient who also played Indian tabla, but played other styles as well, experienced no dystonia when using mallets, but developed marked dystonic flexion of the
Table 1 Clinical characteristics of drummers with dystonia from multiple cohorts.
Abbreviations: DIP (distal interphalangeal); Ext (Extension); F (female); Flex (Flexion); M (male); MCP (metacarpophalangeal); PIP (proximal interphalangeal).
Upper extremity digits represented by numbers 1 (thumb) to 5.

| COHORT | SEX | RACE | AGE AT ONSET, YEARS | AGE AT PRESENTATION/EVALUATION, YEARS | SIDE AFFECTED | DOMINANT HAND | INSTRUMENTS (MUSICAL STYLE) | PHENOMENOLOGY WITH INSTRUMENT | TREMOR REPORTED | SPREAD TO OTHER TASKS | BENEFICIAL INTERVENTIONS |
|--------|-----|------|--------------------|--------------------------------------|---------------|----------------|-----------------------------|------------------------------|-----------------|-----------------------|--------------------------|
| Current series, No. 1 [Video, Case 1] | M    | Caucasian | 23 | 27 | Left | Unknown | Drum, Xylophone | Ext 2, 3, 4, 5 | Yes | Yes – typing | None (trial of carbidopa/levodopa without benefit, unknown dose) |
| Current series, No. 2 [Video, Case 2] | M    | Caucasian | 41 | 44 | Right | Right | Drum set (Pop) | Rex 2, 3, 4, 5; wrist ulnar deviation | No | Yes – Golfing, brushing teeth, holding knife | None (lorazepam without benefit, unknown dose; referred for botulinum toxin injections but lost to follow up and results unknown) |
| Current series, No. 3 [Video, Case 3] | M    | Caucasian | 43 | 45 | Right | Unknown | Indian tabla, classical percussion | Flex 2 | No | No | External sensory trick with tape and orthopedic finger splint |
| Current series, No. 4 [Video, Case 4] | M    | Caucasian | 22 | 25 | Left | Right | Classical Percussion | Irregular tremor at wrist; Flex 3, 4, 5 (PIP/DIP); Wrist Flex, radial deviation | Yes | No | Declined botulinum toxin injections or other treatment trials. |
| Current series, No. 5 | M | Caucasian | 53 | 54 | Left | Right | Drums (jazz, rock) | Wrist Flex and ulnar deviation | Yes | Yes – putting on glasses, drinking from cup | None (multiple treatments tried including carbidopa/levodopa 600 mg daily, clonazepam, trihexyphenidyl 30 mg/daily, Botulinum toxin A injections, with EMG guidance — mild benefit, but limited by weakness: 25 units to each of left FCU, left pronator quadratus, left ECU; occupational therapy, limb immobilization) |

(Contd.)
| COHORT                      | SEX | RACE       | AGE AT ONSET, YEARS | AGE AT PRESENTATION/EVALUATION, YEARS | SIDE AFFECTED | DOMINANT HAND | INSTRUMENTS (MUSICAL STYLE) | PHENOMENOLOGY WITH INSTRUMENT | TREMOR REPORTED | SPREAD TO OTHER TASKS | BENEFICIAL INTERVENTIONS                                                                 |
|-----------------------------|-----|------------|---------------------|-------------------------------------|---------------|---------------|-----------------------------|-------------------------------|----------------|------------------------|------------------------------------------------------------------------------------------|
| Current series, No. 6       | M   | Caucasian  | 19                  | 20                                  | Both          | Right         | Drums (multiple genres)     | Right: Flex 4, 5 (PIP); Left: Flex 4, 5 (PIP), wrist Ext and ulnar deviation | No             | No                     | Good benefit with botulinum toxin A injections using EMG guidance – Right side: FCU 20 units, FDS 25 units. Left side: FCR 15 units, FCU 20 units, EDC 15 units. (Carbidopa/levodopa 450 mg daily with no benefit) |
| Current series, No. 7       | M   | Caucasian  | 33                  | 42                                  | Right         | Right         | Drums, xylophone, vibraphone (multiple genres) | Ext 2, abduction of 5; loosened thumb grip; tightness in forearm and wrist | No             | No                     | Trihexyphenidyl 24 mg daily, modest benefit. Botulinum toxin A injections, with EMG guidance, 60–70% improvement: Right EPL 7.5 units; Right EIP 7.5 units; Right ECR 10 units |
| Current series, No. 8       | M   | Unknown    | 39                  | 42                                  | Right         | Right         | Indian tabla               | Wrist ulnar deviation                                      | No             | No                     | Referred for botulinum toxin injections, but lost to follow up and results unknown |
| Current series, No. 9       | M   | Unknown    | 31                  | 34                                  | Left          | Right         | Classical percussion       | Ext 4, 5 (at MCP), wrist Ext and radial deviation                         | No             | Yes – holding stick between hands | None (Clonazepam, uncertain dose; trihexyphenidyl 6 mg daily without benefit; referred for botulinum toxin injections, but results unknown) |
| Current series, No. 10      | M   | Unknown    | 45                  | 52                                  | Left          | Right         | African-Cuban and African-Caribbean drumming | Ext 2, 3, 4 (at PIP, DIP); Flex 2, 3, 4 (at MCP); wrist Flex, shoulder elevation | Yes            | Yes – handling fork, newspaper | None (Received 2 cycles of botulinum toxin injections elsewhere without benefit; unknown injection pattern) |
| Current series, No. 11      | M   | Unknown    | 39                  | 48                                  | Left          | Unknown       | Timpani (Classical)        | Ext 3, 4, 5 (at PIP); Flex 3, 4, 5 (at MCP); abduction of digits; wrist ulnar deviation | No             | No                     | Diazepam with modest benefit – unknown dose.                                                                 |

(Contd.)
| COHORT                        | SEX | RACE | AGE AT ONSET, YEARS | AGE AT PRESENTATION/EVALUATION, YEARS | SIDE AFFECTED | DOMINANT HAND | INSTRUMENTS (MUSICAL STYLE) | PHENOMENOLOGY WITH INSTRUMENT | TREMOR REPORTED | SPREAD TO OTHER TASKS | BENEFICIAL INTERVENTIONS                                                                 |
|-------------------------------|-----|------|---------------------|---------------------------------------|---------------|----------------|-----------------------------|-----------------------------|----------------|-----------------|------------------------------------------------------------------------------------------|
| Current series, No. 12        | M   | Caucasian | 34                  | 38                                    | Right         | Right          | Snare drum (Multiple genres) | Flex 2, 3, 4, tremor when writing | Yes           | Yes – writing, brushing teeth | Propranolol LA 60 mg daily modest benefit; carbidopa/levodopa 250 mg daily without benefit. |
| Lederman 2004 [6]             | M   | 34                  | 35                  | Right Left                            |              |                | Drum set (Jazz/Rock)       | Right forearm supination, wrist flex | No            | No              | Yes – in opposite hand Trihexyphenidyl (modest)                                           |
| Lederman 2004                 | M   | 21                  | 22                  | Right Left                            |              |                | Classical Percussion       | Right forearm tightening, thumb slides off drumstick | No            | No              | None                                                                                     |
| Lederman 2004                 | M   | 36                  | 39                  | Right Right                           |              |                | Drum set (Country Music)   | Right wrist flex, thumb abduction/extension | No            | Yes             | None                                                                                     |
| Lederman 2004                 | M   | 22                  | 23                  | Left Right                            |              |                | Unspecified – Master’s Degree performance program | Left forearm supination and tremor | Yes           | No              | None                                                                                     |
| Lederman 2004                 | F   | 42                  | 52                  | Both (Left > Right) Right             |              |                | Classical Percussion (Snare drum most affected; also xylophone and other mallet instruments) | Left wrist Ext, tremor; mild right side tremor | Yes           | Unknown         | Low dose propranolol; softer mallets; quit snare drum                                    |
| Lederman 2004                 | M   | 51                  | 53                  | Left Right                            |              |                | Drum set (Jazz)            | Left wrist Flex and ulnar deviation | No            | Yes             | Limb immobilization trial (unknown long term improvement)                                 |
| Ragothaman 2004 [11]          | M   | 31                  | 32                  | Right Unknown                         |              |                | Tabla                      | Ext 1, Flex 2, 3, 4, 5, forearm pronation, wrist ulnar deviation | No            | No              | Botulinum toxin injections (onabotulinumtoxinA)                                           |
| Ragothaman 2004               | M   | 45                  | 47                  | Both (R > L)                          |              |                | Tabla                      | Right: wrist Flex and ulnar deviation; Left finger flexion | No            | No              | Botulinum toxin injections (onabotulinumtoxinA – minimal improvement)                    |
| Brandfonbrener 1995 [17]      | F   | ? 19                |                      | Left Right                            |              |                | Unspecified                | Left Flex 3, Ext 4, 5                | No            | Unknown         |                                                                                         |

(Contd.)
| COHORT                  | SEX | AGE AT ONSET, YEARS | AGE AT PRESENTATION/EVALUATION, YEARS | SIDE AFFECTED | DOMINANT HAND | INSTRUMENTS (MUSICAL STYLE) | PHENOMENOLOGY WITH INSTRUMENT | TREMOR REPORTED | SPREAD TO OTHER TASKS | BENEFICIAL INTERVENTIONS |
|------------------------|-----|---------------------|---------------------------------------|---------------|---------------|-----------------------------|---------------------------------|----------------|------------------------|------------------------|
| Brandfonbrener 1995    | M   | 32                  |                                       | Left          | Right         | Unspecified                 | Left Flex 3, loss of control of 4th/5th digits | No             | Unknown                |                        |
| Brandfonbrener 1995    | F   | 25                  |                                       | Right         | Right         | Unspecified                 | Right Ext 3, 4, 5                | No             | Unknown                |                        |
| Sussman 2015 [18]      | Unknown | Unknown      | Left                                  | Left          | Unspecified | Unknown                     | Left wrist flexion, shoulder abduction | No             |                        |                        |
| Conti 2008 [19]        | M   | 22                  |                                       | Left          | Right         | Drums                       | Tremor                          | Yes            | Unknown                |                        |
| Rosset-Llobet 2012 [9] | M   | 23                  | 23                                    | Left leg      | Unknown       | Drum set (Jazz)            | Toe extension, left toe, ankle, knee tension | No             | No                     | Sensory Motor Retraining |
| Rosset-Llobet 2012     | M   | 20                  | 22                                    | Both legs     | Unknown       | Drum set (Rock)            | Toe flexion, heel elevation      | No             | No                     | Modified practice routines |
| Lee 2014 [8]           | M   | 26                  | 28                                    | Right leg     | Unknown       | Drum set (Heavy Metal)     | Thigh tightness; coactivation of hamstring and quadriceps on EMG | No             | No                     | IncobotulinumtoxinA – slight effect |
| Katz 2013 [7]          | M   | 45                  | 75                                    | Right leg     | Unknown       | Drum set                   | Plantar flexion                  | No             | Yes                   | AFO; botulinum toxin; Functional Electrical Stimulation of peroneal nerve |
| Asahi 2018 [20]        | M   | 22                  | 37                                    | Right hand and foot | Left      | Drum set                   | Reported difficulty with control of fine movements in foot; right forearm tightness | No             | Yes – writing          | Improvement with left Thalamotomy |
| Schirinzi 2018 [21]    | M   | 46                  | 49                                    | Left hand     | Right         | Unknown                    | Loss of dexterity in left hand; wrist flexion and internal rotation of forearm | No             | Yes                    | Slight benefit with levodopa (<20%); greater benefit with trihexyphenidyl (6 mg daily) and botulinum toxin injections. |
| Song 2020 [22]         | M   | 59                  | 59                                    | Left arm      | Unknown       | Janggu (traditional Korean drum) | Left arm and wrist flexion | No             | Yes, in other tasks involving flexion of left arm | Partial benefit with botulinum toxin injections |
right index finger when playing tabla and striking the drum directly with his hand. One drummer found that his dystonia, consisting of thumb, index, and middle finger flexion, was most severe when playing soft passages or when playing the snare drum in particular (Table 1, No. 12).

A sensory trick was identified by four of the drummers. One had improvement of dystonic ulnar deviation of the wrist when he rested his right forearm on his right knee or when someone else applied moderate pressure to his right arm. One found that using heavier drum sticks with thinner grips was helpful, while another noted the opposite, with improvement in drumming with thicker drum sticks. The fourth had marked improvement in dystonic flexion of his right index finger by bringing his thumb next to the finger; he also experienced improvement by taping the dystonic finger and from wearing an orthopedic finger splint, and this became his main therapeutic approach to improve the dystonia while drumming. Several patients modified their technique to improve their playing. These modifications included altering the angle of upper limb approach to the drum, changing the angle of drums, or using compensatory postures (e.g., adduction of the left elbow in one drummer so it was closer to his trunk and supination of the forearm in another drummer). Half the drummers (6/12) eventually had spread of dystonia to activities other than drumming. The non-musical tasks that were affected included typing, putting on glasses, drinking from a cup, golfing, manipulating cutlery, writing, and brushing teeth. The other half retained task specificity, with occurrence of dystonic movements triggered exclusively by drumming.

Only one patient identified a definite physical change or medical issue prior to dystonia onset, undergoing a C4–6 cervical fusion four months prior to developing dystonia. Another had EMG findings of chronic denervation/reinnervation in FCU and FDP III/IV on the side of dystonia, suggesting the presence of an ulnar neuropathy. However, he had no detectable weakness in the affected hand or arm, no sensory changes, and had not experienced clinical symptoms suggestive of ulnar neuropathy. Another drummer noted the prior use of a very heavy instrument strapped to his left shoulder, the side on which he developed dystonia, although this was not clearly linked temporally to dystonia symptom onset.

**INTERVENTIONS**

Nearly all drummers had tried a number of interventions in hopes of symptom improvement; most treatment interventions tried were pharmacological. Three patients had trials of carbidopa/levodopa without benefit; one of these three also tried trihexyphenidyl but stopped due to dry mouth. Two other patients tried trihexyphenidyl with one experiencing only mild benefit, and one with no benefit. Four patients tried benzodiazepines, which produced mixed results; diazepam gave some improvement in one patient, but lorazepam gave no benefit to another and clonazepam no clear benefit to two others. One drummer tried baclofen without improvement. One patient reported modest improvement in tremor that accompanied the dystonic posturing with the use of propranolol long-acting 60 mg/day. Seven patients received botulinum toxin injections; others were offered a trial of injections but declined or had injections performed but were lost to follow up. Of those receiving injections, one was noted to have good benefit, one reported 60–70% improvement, another had mild improvement in symptoms but experienced problematic weakness, and one had no benefit. Three patients had botulinum toxin injections performed by other practitioners and information regarding effectiveness of these injections was not available. Other intervention trials included limb immobilization in one drummer, which led to transient weakness and no benefit. Another patient tried physical therapy, massage, and stretching without benefit in addition to several alternative treatments, including laser treatment and magnetic therapy, which were all ineffective.

**SELECTED CASES AND VIDEOS**

Case 1. (Table 1. No. 1; Video segment 1)

A 27-year-old professional musician was evaluated for hand dystonia that developed 4 years previously. Dystonia while playing his drums and xylophone consisted of extension of left 2nd–5th digits. With his left hand outstretched when not playing, he had mild ulnar deviation of the left hand and mild tremor. He also had dystonia when typing on a small keyboard. A trial of carbidopa/levodopa resulted in no improvement. He was able to remain professionally involved in music, but not as a performer.

Case 2. (Table 1. No. 2; Video segment 2)

A 44-year-old professional drummer of popular music developed dystonia at age 41. While playing, his right wrist would have involuntary ulnar deviation followed by flexion of all fingers resulting in a curled position. He became unable to move his wrist with involuntary contraction of flexor carpi ulnaris and was then unable to drum with his right hand. He experienced spread of the dystonia to other tasks, including golfing, brushing his teeth, and holding a knife.

Case 3. (Table 1. No. 3; Video segment 3)

A 45-year-old percussionist and teacher first developed dystonia at age 43. He was trained in classical percussion, but in the prior 20 years played primarily Indian tabla. He first developed dystonia during a period of intensive tabla playing in India, in which he played 8–10 hours daily. The
dystonic pattern was of involuntary flexion of the right index finger and would occur whenever he used the finger in tabla playing or with other percussive techniques in which the finger was primarily involved. In contrast, he experienced no abnormal postures when using a mallet. Faster passages would reliably trigger the dystonia. He had a clear sensory trick, in which approximating the right thumb to the index finger would dramatically improve the dystonia. In addition to this classic sensory trick, he also identified an external sensory trick in which an orthopedic finger splint or application of tape to the distal affected finger significantly reduced the unwanted postures.

Case 4. (Table 1. No. 4; Video segment 4)
A 25-year-old classical percussionist was evaluated for progressive difficulty controlling the left wrist and fingers while drumming, first evident at age 22. Two years into his symptoms, he developed intermittent, irregular tremor of the left hand while playing, brought on when flexing the wrist. He additionally experienced involuntary dystonic flexion of left 3rd-5th digits at the distal and proximal interphalangeal joints while drumming. He had significant difficulty controlling wrist flexion and extension during strokes and had the sense that the wrist was flexing involuntarily with radial deviation. He finished a Master’s degree in performance, but was unable to continue his performance career because of the dystonia.

DISCUSSION
This largest series of drummers’ dystonia reported highlights the clinical features of this relatively uncommon type of musicians’ dystonia, the results of attempted treatments, and outcomes in 12 patients. These cases span diverse musical styles and techniques of drumming and broaden the spectrum of described phenomenology in drummers’ dystonia. All drummers in our series were male and there was frequent involvement of proximal fingers and the wrist. Only one patient had dystonia proximal to the wrist, consisting of shoulder elevation while playing. The majority had eventual spread of dystonia to tasks other than drumming, and most therapeutic interventions did not yield satisfactory results with several musicians abandoning their performance careers.

There is one previously published series of drummers’ dystonia describing a cohort of 6 percussionists that, similar to our series, was almost exclusively male (5/6) [6]. Median age of onset was 34 years. All but one drummer had predominant or exclusive involvement of the non-dominant arm. The pattern of dystonia was wrist flexion in four, wrist extension in one, and forearm supination in three. Two drummers had jerking or tremor of the hand or arm. Two had involvement of a thumb, but none had involvement of other digits. One patient was able to continue playing by giving up the snare drum and concentrating on percussion instruments using mallets rather than sticks. Three patients tried botulinum toxin injections, but none had lasting benefit and no more than two treatment sessions were administered in each case. One drummer reported significant benefit from trihexyphenidyl taken before each performance. Another patient reported benefit from a trial of limb-immobilization which had been started just prior to the report, but long-term outcomes for this intervention were not available.

Concordant with results of the above study, we also found frequent involvement of the wrist, seen in 8/12 drummers. This propensity for wrist involvement in drummers’ dystonia may reflect the relative frequency and importance of wrist movements in drumming technique [10]. A study evaluating muscle activation in drummers highlighted the centrality of wrist movements in these instrumentalists. Drummers studied noticed that muscle groups producing movement at the wrist were the most important for high-speed movements in their playing, and this was confirmed by objective evaluation [10].

In contrast to the report by Lederman, we found involvement of fingers in nearly all patients in our cohort (10/12). As drumming involves heterogeneous techniques, it is possible that drummers in our cohort utilized techniques or played styles that involve finger movements more than those in the Lederman cohort. At least three patients in our series played styles (i.e., tabla and Cuban-African drumming) that emphasize striking drums directly with the hand more than those that rely on use of a stick or mallet. A similar pattern of dystonia, with wrist and proximal finger involvement, was seen in 2 tabla players with dystonia in a previous report [11]. However, in addition to the tabla and African-Cuban drummers in our cohort, six other players had dystonia involving fingers while playing in styles that generally utilize a stick or mallet. Thus, this dystonic finger
pattern does not appear to be exclusive to drummers that strike the drum directly with their hands.

Another notable feature in our cohort was the eventual spread of dystonia to tasks other than drumming in half the patients (6/12). This is similar to the cohort reported by Lederman showing spread to other tasks in 3 of 6 drummers and underscores the importance of inquiring about spread to non-musical tasks and the impact on activities of daily living in musicians’ dystonia patients. The commonality of spread to other activities in the present and prior cohorts is significant as it emphasizes the potential disability over and above occupational impairment, a risk that appears high in this cohort.

The use of the lower extremities in drum-set is somewhat unique among instrumentalists (apart from certain keyboard and organ players,) and presents the potential risk of developing lower extremity dystonia. This has been elsewhere reported in jazz, rock, and heavy metal drummers [8, 9], but was not seen in our cohort.

All patients in our series were male, though this may reflect gender selection of the instrument rather than a particular predilection to drummers’ dystonia in men. Male predominance of percussion players has been demonstrated in at least one survey of music students enrolled in German conservatories [12]. Similar findings in this country were observed in a survey administered to all professional percussion players who were members of the International Conference of Symphony and Opera Musicians (ICSOM). The survey documented 93 percussionists, of whom 81 (87%) were male [6]. While men do appear to be over-represented among drummers, the male predominance of our cohort may also reflect the higher incidence, in general, of musicians’ dystonia in men as compared to women, with a ratio as high as 4:1 in some studies [13]. It is difficult to draw conclusions about the relative risk of dystonia among drummers as compared to other instrumentalists. In one evaluation of instrumentalists from eight conservatories [14], 2.8% were percussionists. This percentage falls within the range of proportions of drummers with focal dystonia among all instrumentalists seen with focal dystonia in 4 large case series (1–5%) [3–6]. These data may suggest that rates of drummers’ dystonia are proportional to drummers’ representation among musicians, but given limited data, more formal assessments and longitudinal follow up of drummers are needed to draw stronger conclusions.

In addition to presenting data from our series, Table 1 also includes 20 previously published cases of drummers’ dystonia from multiple sources, including upper and lower limb dystonia. Similar to our findings, the other drummers are mostly male, play a diversity of drumming styles and techniques, and have frequent involvement of the wrists and fingers. Only four drummers have been reported with lower limb dystonia, and the pattern is variable, including toe flexion, toe extension, plantar flexion/heel elevation, and more diffuse tension in the leg when playing.

The critical importance of reciprocal inhibition of antagonist muscle groups in accurate drumming was demonstrated in a study comparing electromyographic (EMG) activation patterns of healthy drummers and non-drummers in a rapid drumming task [15]. Healthy drummers showed less co-contracture of wrist flexors and extensors compared to non-drummers. In contrast, breakdown in reciprocal inhibition has been demonstrated in EMG studies of drummers with dystonia, though these studies examined lower extremity dystonia in particular [8, 9]. A study of accuracy of timing in drummers with upper limb dystonia, however, showed increased variability in timing at fast tempos in dystonic drummers, highlighting the potentially severe impact of dystonia on the fidelity of performance [16].

Strengths of our study include a large cohort of drummers who were evaluated at specialty Movement Disorders clinics by experts in the field, the diversity of drummers and musical styles represented, and detailed clinical and videographic information available. We acknowledge that there are limitations with the study’s retrospective design and that not all information was available for all patients, including detailed evaluations of hours played daily, other details of musical training, and demographic details in some cases. Future prospective studies with clinical, videographic, and other quantitative information such as electrophysiology would be helpful in advancing our understanding of drummers’ dystonia. Additionally, there is a significant need for well-designed clinical trials evaluating the use of botulinum toxin in musicians’ hand dystonia in order to better guide treatment dosing, muscle selection, and injection technique, and to offer better evidence-based data to patients when considering treatment approaches.

CONCLUSIONS

Our large cohort involving drummers who played multiple styles with a variety of techniques showed a pattern of dystonia most commonly involving the wrist and proximal fingers and with a high risk of spread to other tasks. These results, taken in context with previously published reports, support the idea that the drumming style or pattern of movements commonly performed may modulate the risk of a particular region being affected by dystonia. Players that utilize finger movements more frequently as part of their playing have a high risk of finger involvement, though finger involvement was also noted in players utilizing sticks or mallets. Further research is needed in the
underlying pathophysiology in order to identify potential environmental strategies to minimize the risk of developing dystonia or to design more effective treatments.

ETHICS AND CONSENT

Written informed consent was obtained from all participants for publication of their videos.

FUNDING INFORMATION

IOB: Advisory board: Biogen Inc., Boston Scientific, Accorda, Amneal Pharmaceuticals; Consultant: LEK Consulting, Ideo Inc., Humancraft.

SGR: Book royalties: Springer; Oxford; Interin: Data Safety Monitoring Board; UpToDate: reviewer; Best Doctors: Consultant.

JGG: Grant/research funding: Acadia, Michael J. Fox Foundation, Parkinson’s Foundation; Consultant: Worldwide Med; Honoraria: Medscape, Davis Phinney Foundation, Parkinson’s Foundation, Movement Disorder Society, and Parkinson’s Foundation.

COMPETING INTERESTS

The authors have no competing interests to declare.

AUTHOR AFFILIATIONS

Ian O. Bledsoe orcid.org/0000-0001-8885-8148
Weill Institute for Neurosciences, Department of Neurology, University of California, San Francisco, US

Stephen G. Reich orcid.org/0000-0002-9813-4562
Department of Neurology, University of Maryland School of Medicine, US

Steven J. Frucht orcid.org/0000-0002-4653-0491
Department of Neurology, New York University Langone Medical Center, US

Jennifer G. Goldman orcid.org/0000-0001-5014-7535
Department of Physical Medicine and Rehabilitation, Northwestern University Feinberg School of Medicine, US; Department of Neurology, Northwestern University Feinberg School of Medicine, US; Shirley Ryan AbilityLab, US

REFERENCES

1. Altenmüller E. Focal dystonia: advances in brain imaging and understanding of fine motor control in musicians. Hand Clin. 2003; 19(3): 523–38, xi. DOI: https://doi.org/10.1016/S0749-0712(03)00043-X
2. Jobusch HC, Altenmüller E. Epidemiology, phenomenology and therapy of musician’s cramp. Music, motor control, and the brain. 2006; 265–82. Oxford: Oxford University Press. DOI: https://doi.org/10.1093/acprof:oso/9780199298723.003.0017
3. Hochberg FH, Harris SU, Blattter TR. Occupational hand cramps: professional disorders of motor control. Hand Clin. 1990; 6(3): 417–28.
4. Brandfonbrener AG, Robson C. Review of 113 musicians with focal dystonia seen between 1985 and 2002 at a clinic for performing artists. Adv Neurol. 2004; 94: 255–6.
5. Tubiana R. Musician’s focal dystonia. Hand Clin. 2003; 19(2): 303–8, vii. DOI: https://doi.org/10.1016/j. parkreldis.2013.07.013
6. Lederman RJ. Drummers’ Dystonia. Medical Problems of Performing Artists. 2004; 19(2): 70–4.
7. Katz M, Byl NN, San Luciano M, Ostrem JL. Focal task-specific lower extremity dystonia associated with intense repetitive exercise: a case series. Parkinsonism Relat Disord. 2013; 19(11): 1033–8. DOI: https://doi.org/10.1016/j. parkreldis.2013.07.013
8. Lee A, Altenmuller E. Heavy metal curse: a task-specific dystonia in the proximal lower limb of a professional percussionist. Med Probl Perform Art. 2014; 29(3): 174–6.
9. Rosset-Llobet J, Fabregas-Molas S, Pascual-Leone A. Drummer’s lower limb dystonia. J Neurol. 2012; 259(6): 1236–7. DOI: https://doi.org/10.1007/s00415-011-6324-2
10. Fujii S, Kudo K, Ohtsuki T, Oda S. Tapping performance and underlying wrist muscle activity of non-drummers, drummers, and the world’s fastest drummer. Neurosci Lett. 2009; 459(2): 69–73. DOI: https://doi.org/10.1016/j.neulet.2009.04.055
11. Ragothaman M, Sarangmuth N, Jayaram S, Swaminath PV, Muthane U. Task-specific dystonia in tabla players. Mov Disord. 2004; 19(10): 1254–6. DOI: https://doi.org/10.1002/mds.20195
12. Lim VKA, Eckart. Musicians’ Cramp. Medical Problems of Performing Artists. 2003; 18: 21–6.
13. Altenmüller E, Jobusch HC. Focal dystonia in musicians: phenomenology, pathophysiology, triggering factors, and treatment. Med Probl Perform Art. 2010; 25(1): 3–9. DOI: https://doi.org/10.21091/mppa.2010.1002
14. Lim VK, Altenmüller E. Musicians’ cramp: instrumental and gender differences. Medical Problems of Performing Artists. 2003; 18(1): 21–7.
15. Fujii S, Kudo K, Shinya M, Ohtsuki T, Oda S. Wrist muscle activity during rapid unimanual tapping with a drumstick in drummers and nondrummers. Motor Control. 2009; 13(3): 237–50. DOI: https://doi.org/10.1123/mcj.13.3.237
16. Dahl S, Grossbach M, Altenmüller E. editor Good playing practice when drumming. International Symposium on
Performance Science 2011. Utrecht: European Association of Conservatories; 2011.
17. Brandfonbrener AG. Musicians with focal dystonia: A report of 58 cases seen during a ten-year period at a performing arts medicine clinic. Medical Problems of Performing Artists. 1995; 10(4): 121–7.
18. Sussman J. Musician’s dystonia. Pract Neurol. 2015; 15(4): 317–22. DOI: https://doi.org/10.1136/practneurol-2015-001148
19. Conti AM, Pullman S, Frucht SJ. The hand that has forgotten its cunning—lessons from musicians’ hand dystonia. Movement disorders: official journal of the Movement Disorder Society. 2008; 23(10): 1398–406. DOI: https://doi.org/10.1002/mds.21976

20. Asahi T, Taira T, Ikeda K, Yamamoto J, Sato S. Full recovery from drummer’s dystonia with foot and arm symptoms after stereotactic ventro-oral thalamotomy: a case report. Acta Neurochir (Wien). 2018; 160(4): 835–8. DOI: https://doi.org/10.1007/s00701-018-3480-5
21. Schirinzi T, Scalise S, Di Lazzaro G, Cerroni R, Chiaravalloti A, Lavorenti Figueras P, et al. Dopaminergic involvement in a drummer with focal dystonia: A case study. Clin Neurol Neurosurg. 2018; 166: 54–5. DOI: https://doi.org/10.1016/j.clineuro.2018.01.023
22. Song S, Kang J. Case of percussionist dystonia in playing the janggu, a traditional Korean percussive instrument [abstract]. Movement Disorders. 2020; 35(suppl 1).

TO CITE THIS ARTICLE:
Bledsoe IO, Reich SG, Frucht SJ, Goldman JG. Twelve Drummers Drumming... With Dystonia. Tremor and Other Hyperkinetic Movements. 2021; 11(1): 6, pp. 1–11. DOI: https://doi.org/10.5334/tohm.577

Submitted: 20 October 2020   Accepted: 10 January 2021   Published: 08 February 2021

COPYRIGHT:
© 2021 The Author(s). This is an open-access article distributed under the terms of the Creative Commons Attribution 4.0 International License (CC-BY 4.0), which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited. See http://creativecommons.org/licenses/by/4.0/

Tremor and Other Hyperkinetic Movements is a peer-reviewed open access journal published by Ubiquity Press.