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Practice Does Not Make Perfect: Temporal Discrimination in Musicians With and Without Dystonia

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Musician’s dystonia (MD), characterized by loss of voluntary control while playing an instrument, is a phenotype of adult-onset isolated focal dystonia (AOIFD).¹ Abnormal sensory processing is a common finding in AOIFD²; the temporal discrimination threshold (TDT) is a marker of this.³ TDT is a measure of the shortest time interval at which 2 stimuli are perceived as asynchronous. It is abnormally elevated in non-MD phenotypes of AOIFD.^{3,4} Abnormal TDTs occur less frequently in MD.³

Musicians perform better than nonmusicians at various timing tasks.⁵ However, compared with healthy musicians, MD subjects exhibit intact timing abilities.⁶ We hypothesized that the nonmusician control subjects might have masked an underlying abnormality in TDTs in the MD subjects, which could be discerned on comparison with control musicians.

We hypothesized that (1) compared with a control population of healthy musicians, musicians with dystonia would have abnormal TDTs; and (2) healthy musicians would have faster, “better-than-normal” TDTs compared with healthy nonmusicians.

We measured TDTs in 20 patients with musician’s dystonia (group 1), 20 healthy musicians (group 2), and 94 healthy nonmusicians (group 3) according to a method previously described.⁷ Briefly, subjects were asked to report when they perceived a delay between a pair of flashing light-emitting diodes positioned on a table in front of them. Repeated trials were averaged, and *Z* scores were obtained for each subject. Two *Z* scores were derived using musician and nonmusician controls as reference populations. The number of abnormal controls in each group was assessed for significance using Fisher’s exact test, with a threshold for significance of *P* = 0.025.

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All subjects gave informed consent, and ethical approval was obtained for the study. All participants had normal cognition, visual acuity, and no sensory impairments or history of significant neurological conditions.

There were no significant differences in age among the 3 groups. Figure 1 plots the TDT results for subjects in each group. The MD group had a mean TDT of 47.3 milliseconds (SD, 23.3 milliseconds). The control musician group had a mean TDT of 23 milliseconds (SD, 7.3 milliseconds), and the nonmusician control group had a mean TDT of 32.9 milliseconds (SD, 15.9 milliseconds).

Using *Z* scores derived from nonmusician controls as the reference, only 20% of the MD group (4 of 20) was identified as having abnormal TDTs (*Z* score 2.5) and 2% of nonmusician controls. Fisher's exact test was not significant.

Using the musician control group as a reference, 45% of MD subjects (9 of 20) and 22% of nonmusician control subjects (21 of 94) were found to be abnormal. Fisher's exact test returned significant *P* values for comparisons between MD subjects and control musicians (*P* < 0.001) and between control musicians and nonmusicians (*P* = 0.02).

Our results indicate that MD subjects have significantly more abnormal TDTs compared with healthy musicians. Our musician control group and larger sample size allowed us to detect this effect that contradicts previous studies of temporal processing in MD. We also identified a significant difference in TDT between musician controls and nonmusicians, which suggests that playing an instrument improves temporal processing. Further research will be required to characterize differences in TDT within the MD cohort.

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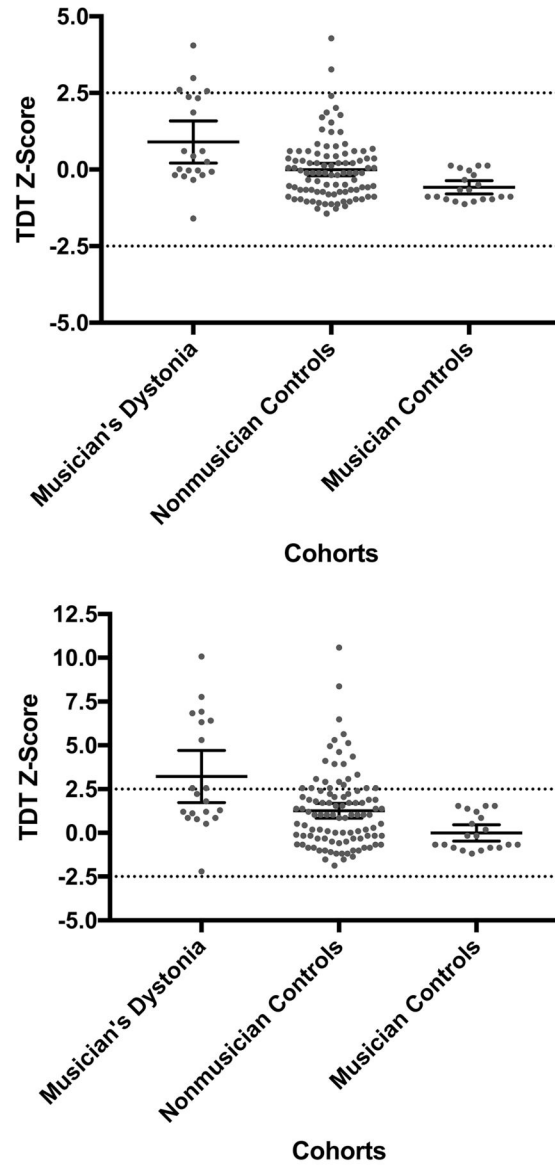


FIG. 1.

Z scores based on different reference populations: two-dot plots of temporal discrimination threshold (TDT) Z scores across the 3 groups, on the left using the healthy nonmusician control participants (group 3) as the reference population (mean, 32.9 milliseconds; SD, 15.9 milliseconds) and on the right using healthy musician controls (group 2) as the reference population (mean, 23.7 milliseconds; SD, 7.3 milliseconds). The dotted lines define Z scores of ± 2.5 SDs relative to the mean of the reference population. Error bars indicate group means and the 95% confidence intervals.