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Psoitive Effect of Zumba on Reaction Time in Middle-to-Older-Aged Female Adults

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by

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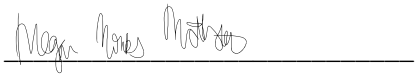

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Abstract

Zumba is a popular dance fitness program that incorporates Latin dance moves and traditional aerobic exercise. Zumba is an effective workout, and research has proven its many benefits, like increased calorie burn and heart rate, improved body composition and quality of life. There is also evidence of other types of dancing and exercise improving reaction time (RT). Zumba may acutely improve RT, but little research exists on this topic. **PURPOSE:** To determine the acute effect of Zumba on RT. We hypothesized that Zumba would result in a significant improvement in RT. **METHODS:** Fourteen middle-to-older-aged 49.00 ± 6.47 females who were experienced in doing Zumba participated in the study. The ruler drop test was used to assess RT. The participants completed the ruler drop test upon arrival, participated in the 45minute Zumba class, and then took the RT test following the class. For the control session, the same group of participants came in on a different day and completed the RT test before and after a 45-minute quiet period, doing non-cognitive-stimulating activities. Session order was randomized for all participants. Paired samples t-tests were used for statistical analysis, with significance set at $p < .05$. **RESULTS:** Zumba participation elicited significant improvements in RT and a large effect ($p = .008$, $d = .836$) when comparing pre/post values. RT was not significantly different following the control session ($p > .230$). **CONCLUSION:** Results of this study revealed that Zumba can acutely improve RT in middle-to-older-aged females who are experienced in participating in Zumba, which is important because RT is used in everyday activities.

Introduction

Zumba is a fitness program that originated in Colombia and combines aerobic exercise with Latin dance moves. Zumba has become the most popular dance fitness program because it feels less like working out than traditional workouts (Blackler et al., 2019). It is known that Zumba is a beneficial form of aerobic exercise, burning more calories and increasing heart rates more than walking for the same length of time (Krause et al., 2022). Zumba is also shown to improve body composition, physical fitness, aerobic and cardiovascular health, balance, muscular strength, and even quality of life (Barranco-Ruiz et al., 2020). However, there is little knowledge on the impact it has on reaction time (RT).

Reaction time is the amount of time between when a stimulus occurs and when a motor response to that stimulus occurs (Malhotra et al., 2015). According to Malhotra et al., RT is a process that involves both a sensory and perceptual aspect. These authors also note that a stimulus is recognized by the receptors in our eyes and ears, and then identification of that stimulus begins in the central nervous system; if we decide that the stimulus is important, then we have an appropriate response. What is essential and important here is the speed it takes for us to respond to that stimulus (Malhotra et al., 2015).

The ruler drop test is a quick and effective way to test RT (Latorre-Roman et al., 2018). It allows many participants to be tested and is still an accurate measure of RT. We decided to use this test due to its feasibility. It is completed quickly and is relatively simple to administer, which is what we tried to keep in mind.

Although there is little evidence regarding how Zumba affects RT, research exists that shows that various types of dancing can improve RT. Dancing is actually a form of exercise that was recommended by the World Health Organization in their 2018-2030 Global Action Plan on

Physical Activity, which notes that this could be because of dancing's benefits on physiologic, endocrine, psychological, and cognitive levels, which is where our focus is (Barranco-Ruiiz et al., 2020). Other types of dancing that have been shown to enhance RT include ballroom dance and Dance Dance Revolution, which is a game. The ballroom dance study found that RT improved significantly after both 6 months and 10 months of ballroom dance practice (Bonavolontà et al., 2021). The Dance Dance Revolution study used this game and a Timed Up and Go test to see if there was a correlation between the two. They concluded that there was a direct correlation between the score from the Dance Dance Revolution game and the Timed Up and Go test and that this game could be a way to improve stepping reaction in patients with Parkinson's disease (Pascal et al., 2018).

We wanted to keep exploring these topics because there is little research on the effects Zumba has on RT. The purpose of this study was to answer and figure out if Zumba will acutely improve RT in a middle-to-older-aged population that is experienced in doing Zumba classes. We hypothesized that Zumba would indeed result in a better RT using a pre and post exercise test.

Methods

Participants

The participants for this study were physically active adults who are experienced in and regularly participate in Zumba. They range in ages from 40 to 61, and they are all females. We recruited 14 participants. The main exclusion criteria were age and gender. We only tested middle-to-older-aged female adults, so we excluded those that are younger than forty. For our control group, we tested the same participants on a separate day.

We protected the participants by adhering to confidentiality. We did not use any identifying factors in recording the data. They were assigned a number, and that is what we went by instead of their name or another factor. The participants also completed the Physical Activity Readiness Questionnaire (PAR-Q) as a screening tool. Before anyone participated in the study, the participants signed an informed consent document, approved by the Institutional Review Board at The University of Alabama.

Instrumentation

The test that was used in our study was the Ruler Drop Test. Within this test, there are individual pieces of instrumentation that were used. We tested RT using the Ruler Drop Test. For this test, all that was needed was a ruler. One study used a 50-60-centimeter-long ruler (Latorre-Roman et al., 2018), but for our study, we used a yardstick, which is 36 inches (91.4 centimeters). We decided to use a yardstick instead of a ruler because with a yardstick, the results are more detailed due to the fact that there are many more numbers/inches on it compared to a ruler (12 inches). We also used score sheets for the participants.

Procedures

The data collection for this study took place at a local fitness facility in the aerobics room. The Zumba classes last 45 minutes, and because the test only took a couple of minutes, the entire process did not exceed an hour for the participants. This is important when considering participant burden. Because these participants are regular members of the Zumba class, they were only adding no more than 15 minutes of their time by participating. The instructor was a certified Zumba instructor and was the same for each participant. The Zumba classes took place on Monday and Thursday evenings from 6:15-7:00 p.m., and each class included warm-up and cool-down procedures.

Prior to completing the Ruler Drop Test and engaging in Zumba, a PAR-Q was filled out by all participants. This ensured that all participants were safe to engage in the exercise and partake in the tests. The PAR-Q asked the participants questions about their general health, and, if necessary, participants may have had to answer follow-up questions regarding any medical conditions that could have prevent them from engaging in Zumba and participate in the study.

Once enrolled, participants began by performing the initial RT test. We administered the test before and after the Zumba class to assess pre- and post-test evaluations to examine the effect Zumba had on RT. The participants were randomly assigned either to be in the Zumba condition or the control condition, and they would perform the alternate condition at the subsequent testing session.

For our control condition, we used the same participants on a different day. We tested their RT and then let them sit for 45 minutes (the same amount of time as a Zumba class). They were not engaging in cognitive-stimulating activities during this time; this was to ensure that their RT was not being affected in any way. They were just relaxing, reading emails, watching tv, etc.

After these 45-minute quiet period, we then administered the post-test for RT. Using this control session allowed us to see the true effect Zumba had on RT in the participants.

Assessing RT using the Ruler Drop Test was effective and relatively easy for the participants, which was good when considering participant burden. To complete the Ruler Drop Test, the participant sat in a chair while the hand stayed in a mid-prone position and the elbow flexed at 90 degrees; the forearm was on a table, and the hand was open at the edge of the table (Latorre-Roman et al., 2018). Next, the researcher held the yardstick vertically so that the 0-centimeter mark was lined up with the fingers of the participant; the researcher then dropped the yardstick, while the participant grabbed it as fast as she could (Latorre-Roman et al., 2018). The participant did this task three times, and the best score was taken. The same researcher administered this test each time for each participant and did not give a signal or any sort of warning as to when the yardstick would be dropped.

Statistical Analysis

The statistical measure was done using SPSS version 28. To test our data, we ran various paired samples t-tests. We rain paired samples t-tests to compare pre- and post-Zumba values, pre- and post-control values, and the differences in pre- and post- values for the Zumba condition and for the control condition. We did each of these three paired samples t-tests for reaction time. We used paired samples t-tests due to the fact that we tested the same participants multiple times. The significance level was set at $p < .05$. This allowed us to compare the differences in RT between both the pre- and post-tests, as well as between the experimental condition and the control.

Results

A total of 14 female participants (age = 49.00 ± 6.47) completed the study. There was a statistically significant difference in RT and a large effect when measuring their performance before and after Zumba sessions (p = .008, d = .836), as seen in Table 1. However, there was no statistically significant difference in RT following the control session (p = .230), and there was a small effect (d = .337).

Table 1

Average scores for reaction time (RT) and the statistical results of the two sessions.

Variable	Time	Mean		SD	Significance	Effect size
Zumba Reaction Time	**Pre**	**12.71**	**±**	**2.894**	***p* = .008**	***d* = .836**
	Post	**9.57**	**±**	**4.033**		
Control Reaction time	**Pre**	**11.64**	**±**	**4.050**	***p* = .230**	***d* = .337**
	Post	**10.71**	**±**	**3.561**		

Discussion

The purpose of this study was to see if there was a difference in RT for experienced middle-to-older-aged participants after they participated in Zumba. There was little research on the effect Zumba has on RT, so our aim was to fill in this gap in the literature to determine the impact of Zumba on these constructs. Our results showed that Zumba did have a significant effect on RT in our participants, supporting our hypothesis.

The results showed statistical significance in RT from the pre-test to the post-test, which is contrary to some existing findings. Sayyad et al. (2021) showed no statistically significant differences in RT after Zumba in professional kickboxers. Sayyad et al. (2021) compared two separate groups of people, with one group getting the experimental condition (Zumba) and the other getting the control condition (regular physical training routine), which could be a reason for the differing results. The inconsistency of findings between studies could also be because of the fact that professional kickboxers aged 18-30 are much more trained than middle-to-older-aged females, and their RT has to already be pretty good due to the nature of the sport. Therefore, this could explain why our participants showed more improvements after Zumba than the participants in the study by Sayyad et al. (2021). Our findings were also the opposite of those reported by Chatzihidiroglou et al. (2018), whose results indicated no significance between their dance condition and their control session, as well as no significance between their pre and post-tests. Our differing results could be because of the age differences of our participants; Chatzihidiroglou et al. (2018) used preschoolers, who are still growing, changing, and learning new things, and therefore, it may take them longer to process the appropriate response to the stimulus. However, their study and ours had similar procedures. For example, their sessions were 45 minutes, and they had an experimental group (dance) and a control group (free play), which

was a different group of kids (Chatzihidiroglou et al., 2018). On average, after participation in Zumba, our participants' RT increased by 3.14 inches on the yardstick. Bonavolonta et al. (2021) found that 6 months of ballroom dancing improved RT, whereas our study showed RT improvements after just 45 minutes of Zumba. So, our study and the one done by Bonavolonta et al. (2021) demonstrate that dance can result in both acute and long-term improvements in RT. For their study, Bonavolonta et al. used a similar RT test; instead of a yardstick, they used an apparatus measuring 31.5 inches covered in friction tape with a weighted rubber disk attached to the bottom end (2021). Their subjects were both male and female adults; their mean age was 59.4 ± 11.6 years, whereas our subjects were females aged 49.00 ± 6.47 (Bonavolonta et al., 2021). These similarities in testing procedures could show that regardless of gender, dance is shown to be an effective way to improve RT in middle-to-older-aged adults, but this topic should be further investigated.

Although our study did show significant findings, it was not without limitations. We had a relatively small sample size of 14 participants, but we showed a large effect size (d = .836) before and after Zumba. Another possible limitation is that the participants knew their goal; they wanted to get better and improve their "score" on the test. We also thought of several ideas for future research. We focused our population on middle-to-older-aged females who are experienced in doing Zumba. Future research could examine a younger population, one that is not experienced in Zumba, or even males. Another idea could be to look at longer-term effects of consistent Zumba exposure, whereas we looked at the acute response.

Overall, our study showed that Zumba had a significant effect on RT and can acutely improve RT after 45 minutes of it. This could encourage middle-to-older-aged females to attend a local Zumba class if they are looking to acutely improve their RT. Reaction time is used in

daily life through things like driving and throwing and catching something. Having a good RT would help make everyday life much easier, especially for middle-to-older-aged adults. RT is such an integral part of daily lives, so it is so incredibly important that RT is functioning well and properly.

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