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# The Effects of 8-Week Dance-Based Aerobic Training in Reaction Time and Body Composition Features

**Aleksandra Gülçiçek[1] Klejda Tani[2] Andromeda Keci[3]**

[1]*Istanbul Gelisim University, School of Physical Education and Sport, Turkey*
[2 3] *Sports University of Tirana, Faculty of Rehabilitation Sciences, Department of Kinesiology, Albania*

**Corresponding author: aleksandragulcicek@gmail.com*

**Authors' Contribution:** A: Study design, B: Data collection, C: Data analysis, D: Manuscript preparation, E: Discussion and conclusion

## ABSTRACT

**Study aim(s):** The aim of this study is the determination of the effects of 8-week dance-based aerobic training in reaction time and body composition features in middle age people who varies between 35-55 years old.
**Methods:** The group consisted of 10 middle age people whose ages were between 35-55 living in the Zeytinburnu area in Istanbul. The data collection has been based on the body composition measurements such as weight, fat percentage, and body mass index by using "Tanita BC 545 N Innerscan Segmental personal body analysis". The reaction time has been measured by applying Hand-Eye, Feet-Eye, and Hand-Feet-Eye Reaction Time with FitLight Trainer. Besides the descriptive statistics of the data Two-Way Repeated Measure ANOVA Analysis was performed based on the fact that the data were parametric.
**Results:** While the positive effects of dance-based aerobic training have been detected on the body composition features ($p<0.05$), there are no statistically significant effects of this training on the reaction time ability ($p>0.05$).
**Conclusions:** Although the results about the effects of dance-based aerobic training resulted to be in line with the literature by showing a significant effect on body composition, it was found that the same training did not affect the reaction time ability. It can be concluded that if dance-based exercises are to be preferred to improve reaction time, they must be performed longer than eight weeks and have a higher frequency.

**Keywords:** Soul Beat, Falling Risk, Reaction Time, Body Composition

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## INTRODUCTION

Nowadays, training for health and wellness is needed more than ever, especially in middle age and the elderly in order to maintain physical and psychological health. These age categories are exposed to the many health issues which appear as age increases and physical activity is necessary for them. However, the injuries and diseases remnant of the past, overweight, and decreases in motor abilities limit them to apply a wide range of movements. So, the training loads are preferred to be average or not higher than sub-maximal [1, 2]. Based on the mentioned limitations of training, these age groups are suitable for aerobic training which are cyclic, sub-maximal, or lower load, and there are no sharp movements that may be the cause of injuries.

Dance-based aerobic training is a multijoint type of training with high inclusion of muscle groups and improves functional abilities which directly affects the quality of life [3, 4]. The current literature explains the importance of these kind of training in body composition features [5, 6, 7].

In the current literature, there is insufficient number of studies explaining the effects of dance-based aerobic training on the reaction time which lengthens with increasing age. Some studies specify positive effects on the reaction time [8, 9], while some studies specify no effects on the reaction time [10].

Based on the current literature even though we expect positive effects of dance-based aerobic training on the body composition features and functional movements, there are no proven effects of this training on the reaction time ability as a good health indicator which avoids the risk of fall in daily tasks [11].

As is known the importance of reaction time in quality of life, especially in middle aged and elderly people, there is needed more information about the effects of dance-based aerobic training which is very applicable to nowadays fitness trends of the middle ages.

As the definition of the effects of dance-based training on reaction time and testing the validity of current literature about the effects of this training on body composition features is so important and there is supposed to be a practical application of this study, our focus is on these two answers.

So, in light of previous research questions, the aim of this study is the determination of the effects of 8-week dance-based aerobic training in reaction time and body composition features in middle age peoples who varies between 35-55 years old.

## METHODS

### *Research design*

The study model was based on the experimental method in which control and experimental groups are divided to control the effects of the training which is applied 8 weeks on the elderly.

### *Study sample*

The group consisted of 10 middle age people whose ages were between 35-55 living in Zeytinburnu area in Istanbul. The participants were informed by the written form about the aim of the study, benefits, and risks (even if there is no potential risk), and participation was voluntary. To avoid the potential risk of coronary issues during the application of training and tests, we systematically measure heart rate by using karvonen formula [12]. The study met the Helsinki Declaration criteria and it was approved by the ethics committee of Istanbul Gelisim University.

### *Data collections tools*

### *Body composition*

Body composition features such as W, F%, and BMI were measured by using “Tanita BC 545 N Innerscan Segmental personal body analysis”, while body height was measured by using Stadiometer, 8 inches 82 inch/20 cm-210 cm Measuring Unit: cm + inches.

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### *Reaction Time*

The reaction time was measured by applying Hand-Eye, Feet-Eye, and Hand-Feet-Eye tests with FitLight Trainer using multiple ligth discs. Participants were positioned 30 cm away from FitLight trainer and directed to use their primary hand or foot to react on the stimulant blue ligth.

Protocol 1: Hand-Eye Test: Three ligth discs were placed, 75 cm above from the ground on a 150x80 cm table and 50 cm apart from each other. Test duration was choosen for 30 seconds.

Protocol 2: Feet-Eye Test: Three ligth discs were placed on the ground, 50 cm apart from each other. Test duration was choosen for 30 seconds.

Protocol 3: Hand-Feet-Eye Test: Six ligth discs were placed, 3x on the ground and 3x 75 cm above from the ground on a 150x80cm table, 50 cm apart from each other. Test duration was choosen for 30 seconds.

### *Exercise Program*

### *Soulbeat (dance-based aerobic training)*

The dance - based aerobic program was based on a Soulbeat program. It emerged as a model, mostly consisting of jazz dance and fitness movements. A dance-based group aerobic exercise program consisted of 50 minutes of activity that began with 5–10 minutes of warm-up, followed by the 30 minutes of main part and concluded with 5 to 10 minutes of cool-down, dynamic stretching, and flexibility exercises.

**Table 1. 8-week dance-based aerobic training**

| | Song | Movements |
|---|---|---|
| 1. | Lordy - Feder feat Alex Aiono | March F B L R, Step – touch, v – step, Clapping, H up-down, Step variations |
| 2. | Slow Dance - Gran Error | Freestyle, V – Step, Hands Up than Drop Down Side Step, Cross Leg to the back, DBL Side Step, Front Leg Kick, Reach Side to Side, C Side Stretch, Leg Bending, Clapping |
| 3. | Playa Grande – Bomba Estereo, Sofi Tukker | Leg Bending, Knee Up for 4 Step Opposite H to the Knee, Step – Touch, Kick to the Front and Step Back with Op. Leg, H Up than Reach the Floor, C Flexion – Extension, Back Step, Plie for 3 Counts, H Open to the Side then Bent, C Rotations, Knee Up for 1 Count |
| 4. | Oh, Nanana vs Abusadamente - DJ AMPA | Heels Up in Plie Position, H on Back of Head, C Half Circle Rotations, Static Plie Position, H on Back of Head, C Rotations from Side to Side, H Up - Down, C Flexion - Extension, Diagonal Knee Up, Half Circle, Knee Up Jumping |
| 5. | Marianela - Lirico En La Casa | Hips Swinging, H Open and Close to the Front, Freestyle, Knee Up Jumping, Op. Elbow to the Knee, DBL Side Step, F Heel kick |
| 6. | El Alfa - Major Lazer ft J Balvin | Leg Bending, Straight H Push to the Back, High Kick the Side and Side Step, H Up-Down, Front Back Kick, Bounce, Jumping Lunge, Jumping, Straight Leg Up for 3 Count, Brisk Walking |
| 7. | Twist İn My Sobriety – Joanne | Side Kick - Knee up, Bicep's curl, Squat, C Side Rotations, Skaters, Side Squats for 2 Count, Lounge with Knee Up |
| 8. | Tokyo Drift – Teriyaki Boyz | Jumping Jack from Side to Side, H Drop Down, open and close, Elbow to Knee, Knee to Elbow with Jump, Squat, H Bend, Close and Open wide, C Side Bending, Leg Bending |
| 9. | Rabbit Hole - CamelPhat, Jem Cooke | Side Lunge with F Kick, Knee Up, jumping at the place, Walking F B, Plie Position, Legs Open Wide, Static Squat, Legs Open Wide and Close to the Front, C Side Rotations |
| 10. | Weke Weke - Elilluminari | Drop toe to the side, Biceps Curl, Jumping, Side Leg Opening in Squat Position, Bent H Position than Side Spinning, Front Toe Tap in Squat Position |
| 11. | Bola Rebola - Tropikalla | Squats, H Cross and Open, C Flexion – Extension, Side High Jumps, Front Kick, Bounce, Step - Touch |
| 12. | Saint Jhn – Roses (İman Berk remix) | H Open to the Side then Bend, Jumping Jack, H Up to the F, Jump and Turn to the Side Squat, Jumping, Legs Open and Wide, H Open to the Side, C slying |

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| | | |
|---|---|---|
| 13. | River - Bigshop Briggs | Dynamic Stretching to all Big Muscle Groups |

*R: Right, L: Left, F: Front, B: Back, Op: Opposite, DBL: Double, H: Hands, C – Core*

### *Data analysis*

In the data analysis, the SPSS 24 program was used in the study. Shapiro-Wilks and Kolmogorov-Smirnov tests were applied for the normality levels of the data. Besides the descriptive statistics of the data, Two-Way Repeated Measure ANOVA Analysis was performed based on the fact that the data were parametric, dependent groups existed, the data were continuously variable, and the number of variables in both groups was the same.

In the repeated measurements, in the TWO-WAY ANOVA Test, no evidence of violation was found in any test according to the Box's Test of Equality of Covariance Matrices results (>0.05).

HAND_EYE – Hand-eye Reaction Time Mean (=.239), FEET_EYE – Feet-Eye Mean Reaction Time (=.648), HAND_FEET_EYE – Hand-Feet-Eye Reaction Time Mean (=.683), MB – Modified Burpees (=.494), X_SMean – Deviation Mean (X cm), (=.372), Y_SMean – Deviation Mean (Y, cm) (=.525), X_MeanH – Mean Velocity (X cm/s) (=.770), Y_ MeanH – Mean Velocity (Y cm/s) (=.286), AU – Field Length (=.402), AB – Field Size (=.127).

In the present study, the Greenhousegeiseer Value of the variables was determined as 1.000 and the interpretation was made on this.

## RESULTS

**Table 2: Pre-post-test differences between the control and experimental groups in body composition tests**

| V | Groups | N | Pre-test | Post-test | Differences between pre-test and post-test | | |
|---|---|---|---|---|---|---|---|
| | | | | | | Sig. | Eta |
| | | | X̄±SD | X̄±SD | F | p | η2 |
| VA | Control Group | 10 | 80.600 ± 12.5224 | 81.630 ± 12.3860 | 1.120 | .304 | .059 |
| | Experimental group | 10 | 74,870 ± 10,854 | 73.190 ± 11.2041 | | | |
| | Pre-post-test (interaction time) | | | | 19,465 | .000 | .520 |
| | Inter-group | | | | 1,820 | .194 | .092 |
| BMI | Control Group | 10 | 30.750 ± 4.7785 | 30,820 ± 4.9562 | 9,717 | .006 | .351 |
| | Experimental group | 10 | 29.290 ± 2.9835 | 28.390 ± 3.3772 | | | |
| | Pre-post-test (interaction time) | | | | 13,271 | .002 | .424 |
| | Inter-group | | | | 1.123 | .303 | .059 |
| YO | Control Group | 10 | 42,386 ± 6.4819 | 43,990 ± 6.5468 | .814 | .379 | .043 |
| | Experimental group | 10 | 36,940 ± 6.1149 | 36.110 ± 6.3583 | | | |
| | Pre-post test (interaction time) | | | | 8,046 | .011 | .309 |
| | Inter-group | | | | 5,584 | .030 | .237 |
| KM | Control Group | 10 | 33.070 ± 1.8845 | 32,700 ± 2.0033 | 6.792 | .018 | .274 |
| | Experimental group | 10 | 31.700 ± 1.2737 | 33,720 ± 2.6811 | | | |
| | Pre-post test (interaction time) | | | | 14,250 | .001 | .442 |
| | Inter-group | | | | .04 | .839 | .002 |
| SUO | Control Group | 10 | 43,570 ± 2.5250 | 42.600 ± 2.6221 | .419 | .525 | .023 |
| | Experimental group | 10 | 47.130 ± 2.9447 | 48.780 ± 3.8961 | | | |
| | Pre-post test (interaction time) | | | | 6.226 | .023 | .257 |
| | Inter-group | | | | 15,016 | .001 | .455 |

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*V – variable, Δ%: improvement %. η2: partial eta square, X̄±SD: mean and standard deviation, VA- body weight, BMI - body mass index, HR - fat ratio, KM - muscle amount, SUO - water amount*

When Table 2 is examined, it is seen that dance-based aerobic exercises had a statistically significant and positive effect on body composition ($p<0.05$). VA: F(19.465), interaction time: =.000 and η2=.520, BMI: F(13.271), interaction time: =.002 and η2=.424, YO: F(8.046), interaction time: =.011 and η2=.309, KM: F(14.250), interaction time: =.001 and η2=.442, and SUO: F(6.226), interaction time: =.023 and η2=.257. For this reason, the applied eight-week dance-based exercises have a positive effect on body composition factors and provide an improvement of 25-52%.

**Table 3: Pre-post-test differences between the control and experimental groups in reaction tests**

| V | Groups | N | Pre-test | Post-test | Differences between pre-test and post-test | | |
|---|---|---|---|---|---|---|---|
| | | | | | | Sig. | ETA |
| | | | X̄±SD | X̄±SD | F | P | η2 |
| HAND_EYE | Control Group | 10 | .376 ± .046 | .315 ± .084 | 7.288 | .015 | .300 |
| | Experimental group | 10 | .373 ± .049 | .328 ± .069 | | | |
| | Pre-post test (interaction time) | | | | .012 | .686 | .010 |
| | Inter-group | | | | .047 | .831 | .003 |
| FEET_EYE | Control Group | 10 | .485 ± .089 | .430 ± .088 | 3.030 | .100 | .151 |
| | Experimental group | 10 | .462 ± .085 | .444 ± .055 | | | |
| | Pre-post test (interaction time) | | | | .744 | .400 | .042 |
| | Inter-group | | | | .020 | .888 | .001 |
| HAND_FEET_EYE | Control Group | 10 | .477 ± .044 | .382 ± .077 | 8.394 | .010 | .331 |
| | Experimental group | 10 | .462 ± .061 | .425 ± .059 | | | |
| | Pre-post test (interaction time) | | | | 1.630 | .219 | .088 |
| | Inter-group | | | | .697 | .415 | .039 |

*V – variable, HAND_EYE – Hand-eye Mean Reaction Time, FEET_EYE – Feet-Eye Mean Reaction Time, HAND_FEET_EYE – Hand-feet-eye Mean Reaction Time, Δ%: % improvement. η2: partial eta squared, X̄±SD: mean and standard deviation.*

When Table 3 is examined, regarding the reaction time of dance-based aerobic exercises applied, it was found that HAND_EYE: F(.012), interaction time: =.686 and $\eta^2$ =.010. Similarly, FEET_EYE test results were found to be F(.744), interaction time =.400 and $\eta^2$ =.042, and HAND_FEET_EYE test results were found to be F(1.630), interaction time =.219 and $\eta^2$= .088.

## DISCUSSION

When the literature was reviewed, it was seen that there are few studies on the developed dance-based aerobic exercise. Based on the available literature data and our experience, the purpose was to determine whether dance-based aerobic exercises, which are considered to affect different motor and psychological factors, affect skills such as body composition, aerobic endurance, recreation, and balance, and to determine the effect size.

It was found that the eight-week dance-based exercises examined in the study had a statistical effect on body weight reduction (η2=52%). In the studies that were conducted by Kaplan (2016) and Bastug (2018), significant differences were reported between the pretest and posttest data in the body weight of the dance exercise [13, 14]. As a result of the study that was conducted by Magno (2012), no significant differences were detected in BMI in the experimental group that participated in oriental dance classes [15].

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Similar results were reported in Özdemir (2014)'s study [16].

It was found in the present study that the fat ratio, which is the most important indicator of weight loss, decreased (η2=30%). In the studies of Serin (2020) and Pınar et al. (2018), it was reported that step-aerobic exercises provided a reduction in body fat ratios as a result of aerobic training [17, 18].

It was not convenient to apply tests measuring aerobic capacity because the sedentary people included in the study were of high age, therefore, the burpees were used in a modified form. The fact that this test included the lower and upper extremities and the trunk enabled the measurement of specific and general endurance. Also, to ensure the reliability and validity of the test, the maximal number was taken as a result and it was requested that there be no pause on the feet or in any position during the test. In this regard, lasting more than 90 seconds and continuous application of the test gave valid and reliable results on aerobic capacity. The tempo of the test is low-medium, and it is applied as a measure of the aerobic system because it is repeated maximally [12]. As a result of the analysis, it was found that the results of the modified burpees test, which measures aerobic endurance, differed positively from the posttests and pretests. The number of burpees repetitions increased by 67% after eight-week of dance-based aerobic exercises applied in our study. Similar results were reported in the study of Arfanda et al. (2022) [19].

When the body parts were examined, it was concluded that while running was limited to the lower extremities, dance-based stretches were more beneficial by incorporating the lower and upper extremities and the trunk into the movement. In the study that was conducted by Sulistyoningrum and Candrawati (2016), aerobic dance significantly reduced the Body Mass Index in the experimental group, and the waist circumference was significantly thinned. Özenoğlu et al. (2016), on the other hand, found a decrease in waist and hip circumferences due to aerobic exercises [20, 21].

Three test protocols (hand-eye, feet-eye, and hand-feet-eye) were applied on the FitLight Trainer Device to examine the effects of dance-based exercises on reaction time [22]. However, when the test results were examined, it was found that dance-based exercises did not have a statistically significant effect. It is already known that reaction time is associated with more brain signaling and muscular activation [23]. In this context, since the reaction time is directly related to the nerve conduction velocity, it is considered to be underdeveloped because of neurological factors. Characteristics such as the conduction velocity of the nerves, which play roles in the delivery of the stimulus to the Central Nervous System and the transmission of the response to the effector organ, and whether the effector muscle is fast or slow, show millisecond differences from person to person [24]. Also, according to Cherbuin and Brinkman (2006), reaction time is "an inherited characteristic determining the time elapsed between a person's first muscular response or behavior to stimuli" [25].

The reaction time in humans is not a characteristic that can develop as quickly as weight loss, fat reduction, and muscle gain. Dance-based exercises are not expected to affect reaction time. The present study supports our thoughts in this direction. Results similar to our study were reported in the study conducted by Chatzihiroglou et al. in 2018 as a result of the 8-week dance program in preschool children, who showed significant improvements in sensorimotor synchronization and balance from the pretest to the posttest (the improvements did not change in the movement reaction time) [26]. In the study of Algün Doğu (2017), similar results were reported to our study [27].

The analysis of reaction time was focused on in the study to test how far the benefits of dance-based exercises can go. It was predicted that dance-based exercises would affect body composition and aerobic capacity, but it was not possible to predict

whether they would affect reaction time. As a result, it was found that eight-week dance-based

exercises did not affect reaction time. To examine the effect of these exercises on reaction time, it is recommended to do them for a longer time or with a higher frequency.

## CONCLUSIONS

It was found that the reaction time measured by three different tests, namely hand-eye, feet-eye, and hand-feet-eye, was not positively affected by dance-based exercises.

The analysis of reaction time was discussed in the study to test how far the benefits of dance-based exercises could go. It was predicted that dance-based exercises would affect body composition and aerobic capacity, but it was not possible to predict whether they would affect reaction time. As a result, it was found that eight-week dance-based exercises did not affect the reaction. It can be concluded that if dance-based exercises are to be preferred to improve reaction time, they must be performed longer than eight weeks and have a higher frequency.

## CONFLICT OF INTERESTS

No potential conflict of interes was reported by the authors.

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## INFORMATION ABOUT THE AUTHOR:

**Aleksandra Gülçiçek:** (Corresponding Author); ORCID: 0000-0003-2461-7438, aleksandragulcicek@gmail.com, Istanbul Gelisim University, School of Physical Education and Sport, Turkey.
**Klejda Keci:** ORCID: 0000-0002-4060-4971, ktani@ust.edu.al, Sports University of Tirana, Faculty of Rehabilitation Sciences, Department of Kinesiology, Albania.
**Andromeda Keci:** ORCID: 0000-0001-9601-2142, alalaj@ust.edu.al, Sports University of Tirana, Faculty of Rehabilitation Sciences, Department of Kinesiology, Albania.

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