Capoeira: The Relationship of An Afro-brazilian Cooperative Movement Art to State Anxiety, State Self-Efficacy, And Prosocial Behavior Tendencies

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Abstract

Objective: Capoeira, an Afro-Brazilian movement art, incorporates elements of dance, martial arts, music, and physical improvisation between partners, comprising a social “game.” The sport has expanded globally from Brazil over the last several decades. However, the potential psychological benefits of capoeira have not previously been scientifically investigated. Inspired by research suggesting the benefits of exercise, meditation, yoga, and mindfulness practices, this pilot study investigated whether engagement in one session of capoeira was associated with altered state anxiety (SA), state self-efficacy (SSE), and prosocial behavior tendencies (PBT) compared to control activities of cooperative or combative movement or a non-movement control (acro-yoga, savate, and a graduate-level mathematics class). Methods: Capoeiristas (n = 117) and controls (n = 15) in the area of Rio de Janeiro, Brazil completed self-report questionnaires measuring SA, SSE, and PBT before and after a session of capoeira or control activities. PBT was subdivided into pain-specific (helping a person in physical need) and money-lending-specific (loaning funds to someone in need) behavioral tendencies. The various control groups were combined due to their small samples. Pre-post changes were analyzed and compared for capoeiristas vs. controls using mixed design ANOVAs. Results: One session of capoeira corresponded to a significant decrease in SA and an increase in state self-efficacy (pre- to post- session); however, this change did not differ significantly from similar pre- to post- session changes observed for the control activities. In contrast, there was a significant interaction of time (pre-post) and activity (capoeira vs. controls) for both overall PBT, $F_{(1,120)} = 11.32$, $P = .001$, and pain-specific PBT, $F_{(1,120)} = 11.315$, $P = .0001$. Specifically, while control participants appeared less likely to exhibit PBT after (vs. before) their sessions, no decrease in this behavior was observed after a session of capoeira. Conclusion: While acknowledging limitations, such as the small samples and diverse nature of the control activities, this pilot study suggests the value of continued investigation into the potential effects of engaging in cooperative movement, such as capoeira, on certain psychological variables, particularly prosocial behavior tendencies. In addition to considering potential transient (state) effects, potential longitudinal effects of capoeira could also be of interest, as has been suggested for mindfulness and yoga practices.

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Introduction

Capoeira is an Afro-Brazilian movement art that incorporates elements of dance, martial arts, music, singing, acrobatics, and physical improvisation between partners to comprise a multifaceted and conversational “game.” It has moved out of Brazil and expanded globally over the last several decades. Masters of capoeira assert that it teaches resilience, artistic expression, self-awareness, community building and networking, and physical and emotional control. Practitioners of capoeira speak of its psychophysiological benefits as well; across ages, level of experience, gender, ethnicity, language, country of origin, socio-economic class, physical ability, and geographical location, participants walk into their capoeira sessions and report that they walk out “feeling better.” However, despite its rising international popularity, and despite growth in the study of the psychological effects of activities such as exercise and other movement arts, virtually no scientific study of capoeira effects exists. This seems potentially valuable given that capoeira incorporates exercise, socialization, and community building, each of which is suggested to have mental health benefits.
The Present Study

This study sought to empirically investigate the potential benefits of capoeira that could be relevant to clinical as well as typical populations, by focusing on three specific psychological variables: state anxiety, state self-efficacy, and prosocial behavior tendencies. Based on the timeline available for this pilot project, the state (or acute), rather than trait (or long-term), effects of capoeira were examined.

State anxiety (SA). denotes feelings of worry, tension, or apprehension that last on the order of moments to hours. Physical activity, partner movement, musical activity, and combinations thereof have all been proposed to correlate with SA reductions. Similar movement arts, including yoga, African Dance, and exercising to music, have shown similar anxiolytic effects after a single session of the activity. Greater decreases in SA and increases in positive affect were associated with forty-five minutes of martial arts training versus stationary bike exercise, and a study of the emotional and hormonal responses of Argentinian tango dancers suggested that motion with a partner to music has more positive effects on emotional state than control conditions (no-partner, no-music, and no-partner plus no-music).

State self-efficacy (SSE). refers to an individual’s belief in his or her own capacity to successfully complete a given task. It is believed to be a primary factor in influencing behavior and can be increased in its state form through mastery experiences, social modeling—watching someone similar to oneself succeed at the task—and social persuasion, such as receiving verbal encouragement from others. SSE has been shown to correlate with self-esteem and skill acquisition and has a significant interaction with factors such as one’s emotional state and level of stress. Given that capoeira includes components of physical activity, socialization, and skill acquisition, we investigate whether engagement in it influences SSE.

Prosocial Behavior Tendencies (PBT). are defined as the propensity toward voluntary actions intended to help or benefit another individual or group of individuals. Prosocial behaviors show a relationship with affect and mood, as well as compassion, empathy, and attitude towards a group. One session of capoeira has multiple dimensions of socialization and group interaction. Capoeira classes draw upon strong relationships to a community that have been fostered on broad temporal scale—that is to say, relationships that began to take place at a participant’s first class. Capoeira, as a whole, includes community building through training together and social events, developing friendships, and rallying around one’s training class, an academy, or the whole of the associated capoeira group. On the smaller scale of one single class session, interpersonal communication in capoeira involves moving together in unison, singing and playing instruments communally, prolonged eye contact, smiling, teamwork, and adopting a deliberately inclusive attitude toward working with each other. Many of these factors have already been linked to prosocial tendencies; for example, synchronized movement has been suggested to foster cooperation, have correlates with emotional responding, and increase costly altruism, and prolonged eye contact has been correlated to a greater tendency toward prosocial behavior in several studies.

We hypothesized that engagement in a session of capoeira as compared to control activities would reduce (pre vs. post) SA, increase feelings of SSE, and increase PBT.

Methods
Participants

The experimental group consisted of 117 practitioners of capoeira (both angola [n = 18] and regional [n = 99] styles) recruited from their regular capoeira classes within 100 miles of the Rio de Janeiro area of Brazil. Participants varied in age (M = 29.6 years, SD = 9.45, range = 18 to 69, for the 115 reporting it), and gender (35 females and 80 males of the 115 reporting it). Surveys were distributed to 11 different capoeira groups across 14 different administration sessions.

A control group of 15 participants was drawn from a cooperative movement art (n = 6), a combative movement art (n = 4), and a non-movement control group (n = 5). The study was originally designed to include larger numbers of participants in each of the control categories, but due to low recruitment, the three groups were combined rather than analyzed separately. Descriptions of the three control activities follow.

Savate, also known as French boxing, was chosen as a control activity because it hinges upon partner martial arts movements but also includes actual strikes and physical fighting where the objective is to beat one’s opponent. Subjects included four males during their normal class time at XFusion Fitness in Icaraí, Niterói, Rio de Janeiro. Of the two who reported their ages, the average age was 23.5 years (SD = .707).

Acro-Yoga, the cooperative movement control, involves two or more people moving with and balancing on each other in a combination of acrobatics, yoga, and dance. Despite similarities including teamwork, body awareness, constructive partnership, and movement to music, acro-yoga differs from capoeira in that acro-yoga involves more constant physical contact as pairs or groups work together to construct specific poses with their bodies. Six participants completed surveys before and after their normal class times at XFusion Fitness in Icaraí, Niterói, Rio de Janeiro (2 males, 4 females). Of the participants who responded to the demographic questions, the average age of practitioners was 29 years (N = 6, SD = 3.22).

Graduate-Level Mathematics served as the non-movement control, and five members of a section of Geometria Riemanniana Global (“Global Riemannian Geometry”) at the Gragoatá campus of the Universidade Federal Fluminense (UFF) in Niterói completed control-specific surveys before and after their normal class. Of the three male and two female students who provided demographic information, the average age of class members was 33 years (SD = 8.72), and in terms of experience, all were at a graduate level of mathematics or higher.
Outcome Measures

Each pre- and post-session survey contained questions corresponding to the measurement of SA, SSE, and PBT scenarios. While sample questions appear here in English, all data collection material was translated into Portuguese by the primary researcher and a bilingual Brazilian, and data collection took place only in Brazilian Portuguese.

**State Anxiety.** SA was measured with questions taken from Form Y-1 of the State-Trait Anxiety Inventory.1 The STAI is a commonly used, internally and externally valid measure of both state and trait anxiety, and it is often utilized in clinical settings to diagnose and distinguish anxiety from depression.28 Participants were asked to rate on a four-point Likert scale their responses to the twenty questions pertaining to SA, such as “I feel nervous” and “I am worried” from “Almost Never” to “Almost Always.”29 The questions themselves include both direct and reverse-worded items, where direct wording (10 items) corresponds to the negative feelings, such as “I feel worried,” and indirect (10 items) corresponds to the positive feelings, such as “I feel calm.” Possible summed scores range from 20 and 80, where higher numbers indicate a greater amount of anxiety.2 For the purposes of analysis and comparison in this study, mean score of the participant’s SA responses before and after capoeira or the control activity was computed. As not all participants responded to all of the questions in each section, means provided more accurate representation of the existing data than a summed score.

**State Self-Efficacy.** The General Self-Efficacy Scale (GSE), developed by Jerusalem and Schwarzer in 1981 and used to survey hundreds of thousands of participants in a multitude of studies, was used to gauge participants’ feelings of SSE.23 Ten questions such as “I can always manage to solve difficult problems if I try hard enough” appeared on both the before and after questionnaires, and participants rated their responses on a four-point Likert scale from “Not at All True” to “Exactly True.” The measure calls for the responses to all ten items to be summed to yield the final composite score, with possible scores ranging between 10 and 40. However, similar to the SA measure, mean rather than summed scores were analyzed.27

**Prosocial Behavior Tendencies.** Four prosocial behavior scenarios and corresponding question sets were developed for the purpose of this investigation, taking into account previously used measures of prosocial tendencies, especially the Prosocial Moral Reasoning Test (PROM).28 The scenarios used in this study differed from scenarios in the PROM and other prosocial choice tasks by catering more specifically to real-life scenarios commonly encountered by the target demographic examined in this study (i.e., Brazilian capoeiristas or control participants). Four scenarios were developed to tap two basic tendencies (helping a person in pain or helping by lending money). The “Pain-Specific PBT” examined both a participant’s imagined behavior when asked (a) to stop and help someone with an injured leg that would make the participant late to an important meeting and (b) to donate blood to another person at personal cost. The “Money-Lending-Specific PBT” examined the participant’s willingness to lend money to another person (a) which would render the participant unable to go on a much anticipated vacation, as well as (b) when the borrower does not explain why he or she is soliciting the money.

After reading each scenario, participants rated on a ten-point scale (“not at all” to “absolutely, with no questions asked”) how likely they would be to help the other person. Additionally, participants rated their likelihood of helping when the person in need varied in their connection to the participant. For example, for each scenario, participants rated how likely they would be to aid a stranger, a casual acquaintance, a practitioner of his or her activity (capoeira, acro-yoga, savate, or a mathematics graduate student), and a practitioner of his or her activity within his or her own specific group/class.

As the PBT measure used in this study is modeled upon, but substantially different from, the Prosocial Moral Reasoning Test (PROM), as well other previously used measures of prosocial tendencies, a new scoring method was developed. Each participant responded to two hypothetical scenarios pre- and post-session, for a total of four scenarios per participant. Of the two pre-session scenarios, one corresponded to a pain-specific PBT, and the other corresponded to a money-lending-specific PBT; different specific scenarios were presented in those two categories on the post-session test (i.e., the alternate pain-specific scenario and alternate money-lending-specific scenario).

Thus, the sixteen PBT items completed by each participant (8 pre- and 8 post-session measures) included two types of PBT scenarios (pain-specific or money lending) x 4 levels of connection (stranger, casual acquaintance, general activity practitioner, own classmate) for each scenario. These were averaged to create three composite measures for analysis: Composite PBT (means of the 8 pre-session vs. the 8 post-session items), Pain-specific PBT (means of the 4 pre-session vs. 4 post-session pain-specific items), and Money-lending PBT (means of the 4 pre-session vs. 4 post-session money-lending-specific items).

**Procedure**

Participants completed surveys before and after their classes. After signing the consent form, participants completed a pre-class survey, participated in the class, and then completed the post-class survey before filling out the separate demographic information survey. To avoid a within-subjects sequencing effect, the SA and SSE questions were presented in different orders for the pre- and post-session questionnaires; however, the same questions were administered each time. In contrast, the PBT survey presented different scenarios for the pre- vs. post-session questionnaires, but always included a pain-specific and money-lending-specific scenario each time. Additionally, the specific scenarios were counterbalanced across participants.

The surveys administered to the control groups differed from those given to the capoeira group only for the prosocial behavior surveys in which participants were
asked how likely they would be to offer help to a person who engaged in the control activity, or did the control activity as part of their group, as opposed to their likelihood of offering help to a practitioner of capoeira. The surveys took approximately five to ten minutes to complete before the session and approximately ten minutes afterwards.

**Analyzes**

The dependent variables of SA, SSE and PBT measures were each analyzed using a 2 x 2 mixed design analysis of variance (ANOVA) for the within-subject independent variables of time (pre- versus post-session) and the between-subject variable of activity (capoeira vs. control activity).

Additionally, background analyses to test the equivalence of the capoeira and control groups were conducted with t tests (for age) and chi square (for gender). Given the small number of participants in each control activity, they were combined into a single control group.

**Results**

There was no significant difference between the capoeira and control groups with respect to age, $t_{(120)} = 0.23$, ns, or gender, $\chi^2 = .56$, ns.

**State Anxiety and State Self-Efficacy.** One session of capoeira corresponded to a significant decrease in SA and increase in SSE pre- to post- session; however, this change did not differ significantly from pre- to post-session changes observed for the control activities.

**Overall Prosocial Behavior Tendencies.** Overall PBT showed a significant interaction of time (pre-post) and group (capoeira vs. controls), $F_{(1,120)} = 11.32, P = .001$ (Figure 1A). Inspection of the graph suggests that, while control participants appeared less likely to exhibit PBT after (vs. before) their sessions, no decrease in this behavior was observed after a session of capoeira. To verify this interpretation, simple main effects for the interaction were explored with ANOVAs, There was no significant difference by group (capoeira vs. controls) in overall PBT at the pre-session time point, $F_{(1,124)} = 1.19, P = .278$; however, the capoeira group showed higher post-session PBT scores than the control group, $F_{(1,125)} = 8.4, P = .004$.

**Prosocial Behavior Tendencies (Type-Specific).** The measure of pain-specific PBT composite also showed a significant interaction, $F_{(1,120)} = 11.315, P = .001$, between the between-subject factor of time (pre- versus post-session) and the within-subject factor of group (capoeira vs. controls). The nature of this interaction was the same as for the overall PBT. However, there was no equivalent interaction for the money-lending-specific PBT measure, $F_{(1,123)} = .605, P = .438$.

**Prosocial Behavior Tendencies (Interpersonal Level).** To explore our finding that capoeira practice seemed to differentially influence only the pain-specific PBT composite, we ran the same 2 x 2 mixed design ANOVA to investigate the patterns of effect for capoeira and time on individual pain-specific PBT items for each of the four interpersonal levels (stranger, casual acquaintance, practitioner of the same activity, fellow classmate, again comparing pre- and post-session item scores). The same significant interactions of time point (pre- vs. post-session) and group (capoeira vs. controls) were obtained for each of the four interpersonal levels of pain-specific PBT; likelihood to aid a stranger, $F_{(1,120)} = 8.484, P = .004$; to aid a casual acquaintance, $F_{(1,121)} = 11.39, P = .001$; to aid a practitioner of the general activity (i.e. someone who plays capoeira, or engages in the same control activity), $F_{(1,120)} = 5.45, P = .021$, or to aid a fellow classmate, $F_{(1,124)} = 7.846, P = .006$ (Figure 1B). Again, while control participants seemed to have become less likely after their activity to help a stranger, casual acquaintance, practitioner of the same general activity, or classmate, the capoeira group appeared to show no reduction in these helping tendencies when faced with a pain-specific situation.

**Conclusion**

Although the data suggest a reduction in state anxiety and an increase in self-efficacy feelings between pre- and post-session measures, this relationship is not specific to capoeira, which is to say that capoeira cannot be claimed to reduce...
anxiety or increase self-efficacy feelings more than the control activities. It could be that any session of concentrated activity causes a similar reduction in anxiety and augmentation in self-efficacy. The beneficial effects of focus have been examined and could be examined in future studies, both with respect to movement arts and in terms of other therapeutic activities.

With respect to prosocial behavior tendencies, the significantly different results found for the capoeira and control groups’ post-session PBT measures may relate to the fact that capoeira involves multiple activities that may increase prosociality. As a session of capoeira involves moving together in unison, singing and playing instruments communally, prolonged eye contact, smiling, teamwork, and adopting a deliberately inclusive attitude toward working with each other, this could influence in-group feelings and prosociality to a greater extent than the control activities, even those that include some similar elements, but perhaps fewer of them. It has also been suggested that exertive synchronized movement is an effective group bonding activity, and that both synchrony and exertion have significant independent positive effects on in-group bonding, which provides another possible explanation for the significant difference between the capoeira and control conditions with respect to post-session PBT.

That there was a significant interaction of time point and group with respect to all interpersonal levels of the pain-specific PBT measures, but not the money-lending PBT, could very well have been correlated with the state of the Brazilian economy at the time of data collection. During the month of data collection, the Brazilian real to U.S. dollar conversion fell from 3.37 real per dollar to 3.56 real per dollar, which represents a substantial and less than favorable shift for Brazilians. More than likely, even in hypothetical money-lending scenarios, Brazilians would have had increased reservations about lending money. Perhaps there would also have been significant differences in the money-lending PBT measures had the economy not fallen as data were being collected. Further, while the PBT effects may be caused by engagement in capoeira, alternative explanations are possible because participants were not randomly assigned to groups. For example, different types of individuals may choose to engage in capoeira versus the control activities, and those differences may explain the differential post-session effects.

While acknowledging limitations, such as the small samples and diverse nature of the control activities, this pilot study suggests the value of continued investigation into the potential effects of engaging in cooperative movement, such as capoeira, on certain psychological variables, particularly PBT. In addition to considering potential transient (i.e., state) effects, potential longitudinal effects of capoeira could also be of interest, as has been suggested for mindfulness and yoga practices.

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