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ACUTE PSYCHOLOGICAL EFFECTS OF AIKIDO TRAINING

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ABSTRACT

Background. Aikido is a philosophy and an Eastern martial-art which is conjectured to have many positive effects on mind and body. At this time there is limited, but growing research on this topic. The objective of the current work was to examine for the first time the hypothesis that aikido training, like many other western forms of organized physical activities, has acute psychological benefits as manifested via favourable changes in affect and the flow experience.

Methods. Aikidokas (N = 53) took part in an *in-situ* investigation in which they completed the Positive Affect Negative Affect Schedule (PANAS) on at least three different occasions before and after their practice. They also completed a flow questionnaire at least on three occasions after their practice.

Results. The results indicated that positive affect increased, and negative affect decreased ($p < .001$) from pre- to post-practice. Aikidokas reported flow experience that on the average was not greater than that reported for other exercises; however it was greater than that reported after video-sport games. The reported flow was independent of the magnitude of change in positive and/or negative affect. The more experienced aikidokas experienced greater skill-challenge harmony, but not oneness with the experience, which are two constructs in flow, than less experienced practitioners.

Conclusion. These findings reveal relatively clearly for the very first time in the literature that aikido practice has acute, or immediate, psychological benefits akin to other martial arts and exercises.

Keywords: affect; budo; flow; martial art; zen.

INTRODUCTION

Epidemiological studies show that physical activity, in general, has numerous health benefits (Lee et al., 2011; Miller et al., 2016). In addition to physical health benefits, habitual physical activity has positive impact on people's psychological health as well (Acevedo, 2012). Most forms of planned physical activities trigger immediate psychological benefits as demonstrated in studies with aerobic dancers (Rokka, Mavridis, & Kouli, 2010), cyclists (Petruzzello, Snook, Gliottoni, & Motl, 2009), hatha yoga- (Lavey et al., 2005; West, Otte, Geher, Johnson, & Mohr, 2004), and Bikram yoga practitioners (Szabo, Nikházy, Tihanyi, & Boros, 2016), shadowboxers (Li & Yin, 2008), swimmers (Szabo et al., 2018; Valentine & Evans, 2001), walkers (Dasilva et al., 2011) and Nordic walkers (Stark, Schöny, & Kopp, 2012), runners (Szabo & Ábrahám, 2013), spinners (Szabo, Gáspár, Kiss, & Radványi, 2015) and possibly other exercisers.

Martial arts are organized forms of movements geared primarily towards various forms of soft and hard self-defence while also being a form of physical activity. Bowman (2017) argues against the reductionist definitions of martial arts referring to their uniqueness in philosophy, orientation, and movement. These activities also yield psychological benefits. Indeed, positive changes due to martial arts training were reported in tea-kwon-do (Toskovic, 2001) and tai-chi (Wang et al., 2010). However,

Foster (1997) found that while karate training lowered trait anxiety, no changes were observed after aikido training in measures of self-esteem, anxiety, and anger expression.

Aikido is a martial art originating from Japan around the beginning of the twentieth century; it is practiced in 130 nations around the world. Its founder was Morihei Ueshiba who developed it after studying extensively numerous combat systems, both armed and unarmed. Aikido is a means of fighting for self-defence embedding the philosophy to "improve one's character according to the rules of nature" (Aikikai Foundation, 2018). Its meaning can be summarized as "the way of Spiritual Harmony", where "Ai" means harmony, connection, "Ki" means spirit, life or cosmic energy, and "Do" is a method, the pathway (Szabolcs, Köteles, & Szabo, 2017). The practice of aikido is typically performed in pairs, with the aim to defend oneself without hurting the attacker, while creating a harmony in movement (to date no competitions are held in aikido). It is practiced through blending with the motion of the attacker and redirecting the energy of the attack by decentralizing the body in a controlled and relaxed way, with heightened state of awareness, employing circular and spherical movements (Stevens, 2001). Aikido is a parallel practice of mindfulness (Lukoff & Strozzi-Heckler, 2017) that is associated with the flow experience (Cathcart, McGregor, & Groundwater, 2014).

As most Japanese martial arts, aikido is founded on the philosophy of "ichi-go ichi-e" (like in English the "here and now", but more precisely translated as "one time, one chance"). This thought conveys a state of full absorption into the action. The martial artist must only focus (and concentrate deeply) on the here and now throughout the practice. This absorption into the practice is best achieved when one's skill matches the challenge and/or experience (Moneta, 2012) and culminates when both the skill and challenge are high, resulting in unison or oneness with the experience (Csikszentmihalyi, 1997). Therefore, highly skilled aikido practitioners could be expected to experience more flow than their less experienced counterparts, which is a conjecture that only received tentative support in the literature (Reguli, Čihounková, & Sebera, 2014) and, hence, begs for more research in the field.

While several psychological health effects of aikido could be expected from its practice based on its movement complexity involving balance, energy, force, endurance and harmony, empirical evidence for its acute mental benefits is almost lacking. Two studies that examined the immediate or acute psychological effects of aikido training projected negative findings. For example, in an early study, aikido practice did not decrease Type A behaviour in contrast to control participants or aerobic exercise practitioners (Jasnoski, Cordray, Houston, & Osness, 1987). In a later investigation, Delva-Tauiliili (1995) employing a pre-/post-training design found no changes in aggressive behaviour and self-control attributable to aikido training. However, these two studies focused on pathological states. Concerning healthy individuals, while numerous studies and reviews examined the acute psychological effects of a single bout of exercise (Basso & Suzuki, 2017), such research was not conducted to date with aikido practitioners. Based on the very limited findings projecting negative results on some psychological measures after aikido training, research enthusiasm seems to dampen since no reports were published on the immediate psychological benefits of aikido training in the new millennium. However, based on its philosophy and movement linked to flow, instant psychological benefits of aikido training may be expected to occur, in the affective states for example, similarly like in tai-chi (Wang et al., 2010). Pleasant psychological feelings after training, in general, fuel motivation and affinity for the activity as based on the competence motivation theory (Elliot, Dweck, & Yeager, 2017). However, the acute psychological effects of aikido training were not tested to date.

The objective of the current *in-situ* research was to assess the aikido training-induced changes in positive- and negative affect by assessing the subjective ratings of these measures after several, but a minimum of three, aikido training sessions. First, we hypothesized that the average rating of positive affect will be greater - while that of negative affect will be lower - after than before training (baseline). Second, we conjectured that aikido practitioners will experience flow, manifested in balance between skill and challenge and oneness with the movement during practice (Csikszentmihalyi, 1997). Third, based on Reguli et al.'s (2014) tentative findings we hypothesized that the experienced aikidoka will exhibit greater change in affect and report more flow experience than less experienced practitioners.

METHODS

Participants. Participants were adults (N = 53, age = 37.2 ± 10.56 years, range 18–57, 85% males) practicing aikido as a recreational activity on a regular basis. Actual frequency of aikido practice with respect to the last 3 months was 2.2 ± 0.77 bouts/week. Concerning aikido experience, 52% of participants ranked below the black belt, and 48% wore a black belt (i.e. 1st *dan* or above). Participants were recruited in aikido clubs of the Aikido Foundation in the Budapest metropolitan area. All the participants signed an informed consent form before participation. The study was conducted with the approval of the Research Ethics Board of the Faculty of Education and Psychology at ELTE Eötvös Loránd University in Budapest.

Measures. The Positive Affect Negative Affect Scale (PANAS – Watson, Clark, & Tellegen, 1988) was used for the assessment of affect at various intervals in the study. In the current work we adopted the 10-item psychometrically validated Hungarian version of this instrument (PANAS-HU; Gyollai, Simor, Köteles, & Demetrovics, 2011). The scale is comprised of 5 positive items (i.e., *alert, active*) and 5 negative items (i.e., *nervous, upset*). Each item is rated on a 5-point Likert scale ranging from 1 (*very slightly or not at all*) to 5 (*very much*). An aggregate score is then obtained for both positive- and negative items. The PANAS has a long history of excellent psychometric properties (Ostir, Smith, Smith, & Ottenbacher, 2005; Watson & Clark, 1999). The internal reliability of the scale in the current study was α = 0.857 and 0.853 (before and after practice) for positive scale items and α = .677 and .674 (before and after practice) for negative scale items.

The 20-item Hungarian Flow State Questionnaire (FSQ; Magyaródi, Nagy, Soltész, Mózes, & Oláh, 2013) measures the intensity of the recently experienced flow state on a 5-point Likert scale ranging from 1 (*not at all characteristic of me*) to 5 (*very much characteristic of me*). The FSQ was derived from several versions of the Flow State Scale (Jackson, Eklund, & Martin, 2010). The instrument has two subscales. One of the subscales measures the skill-challenge harmony and the other gauges oneness with the experience. The internal consistency (Cronbach α) of the scale in the current study was α = .892 for the skill-challenge harmony subscale and α = .733 for the oneness with the experience subscale.

Procedure. Participants were informed that the goal of the research was the measurement of changes in mood during aikido training bouts. Before starting the training, participants were asked to complete the 10-item PANAS. Following the training, they completed the PANAS and the FSQ. At least three assessments (maximum 9, altogether 257 recordings, mean = 4.85, SD = 1.703) were obtained from each participant.

Statistical analyses. All statistical calculations were performed with the Statistical Package for Social Sciences (IBM SPSS, v. 25. IBM Corp., 2017). The mean values of the assessments on different occasions were calculated for the dependent measures for each participant. First a nonparametric test, that is less stringent on the sample size than its parametric equivalent (Pett, 2015), was adopted to examine whether there were differences between men and women in any of the dependent measures. Since based on the results of the Shapiro-Wilk test the assumption of normality in the data obtained for negative affect was violated, the more conservative Wilcoxon Signed-Rank test was applied for testing the changes in both positive- and negative affect, which also eliminated the concern about the regression toward the mean. Since the Shapiro–Wilk test was statistically not significant for the flow data, the hypothesis that aikido training is associated with flow was tested with one-sample t-test. A regression analysis was used the verify the predicting power of changes in positive-/negative affect on the flow experience. Finally, Mann–Whitney U tests were used to examine the differences in the dependent measures between less experienced and more experienced aikido practitioners.

RESULTS

Independent samples Mann–Whitney U tests indicated that men and women did not differ in positive- and negative affect before or after the training ($p > .05$), nor did they differ in the two flow variables that were assessed after the training ($p > .05$). Therefore, the full data-set, obtained from both men and women, was included in all the subsequent analyses. Descriptive statistics are presented in Table.

Wilcoxon Signed-Rank tests indicated that positive affect ratings were greater after the aikido training (mean rank = 29.11, *Mdn* = 18.67) than before the training (mean rank = 18.53, *Mdn* =

Dependent measures	M	SD	Mdn	% Regression to the mean (100[1-*r*]) *Pre-Post Measures*
Positive affect before practice	17.09	2.729	17.33*	33.4
Positive affect after practice	18.39	2.947	18.67	
Negative affect before practice	6.10	1.556	5.38*	15.6
Negative affect after practice	5.54	1.156	5.00	
Flow: skill-challenge harmony	37.65	5.74	37.6	N/A
Flow: oneness with the experience	36.91	3.72	37.0	

Table. **Means, standard deviations and medians of the assessed variables, also indicating the percent regression to the mean between the repeated measures**

Note. *Statistically significant from the after-practice value (Wilcoxon Signed-Rank test, $p < .001$).

17.33) $Z = -3.61$, $p < .001$ and the effect size (r) was .50, while the rating of negative affect were lower after training (mean rank = 17.67, *Mdn* = 5.00) than before the training (mean rank = 10.33, *Mdn* = 5.38), $Z = -4.46$, $p < .001$, $r = .61$. Both effect sizes were large (Rosenthal, 1994).

Since the Shapiro-Wilk test was not significant for the flow data, first a one-sample t-test was used to determine whether aikido practitioners reported experiencing flow above the median value of the FSQ scale after their training. This test was statistically significant for both, skill-challenge harmony (t [52] = 9.70, $p < .001$, 95% C.I. of the mean difference = 6.07–9.24, effect size [Cohen's d] = 1.33) and oneness with the experience (t [52] = 13.53, $p < .001$, 95% C.I. of the mean difference = 5.88–7.93, $d = 1.86$). Subsequently, we compared the mean values of the aikido practitioners with those reported earlier by Magyaródi et al. (2013) for video-sport games players. The test was again statistically significant for both, skill-challenge harmony (t [52] = 10.80, $p < .001$, 95% C.I. of the mean difference = 6.93–10.10, effect size $d = 1.48$) and oneness with the experience (t [52] = 21.70, $p < .001$, 95% C.I. of the mean difference = 10.0–12.10, $d = 2.98$). Finally, we also compared the participants' flow experience reported after aikido training with those reported by university students after aerobic exercise and spinning exercise (Szabo, 2018). After adjusting the alpha probability level with the Bonferroni correction for multiple tests, the one sample t-tests yielded no statistically significant differences neither in skill-challenge harmony nor in oneness with the experience between the means of aikido practitioners, aerobic- and spinning exercisers ($p > .05$; refer to Figure).

Subsequently, we calculated a total flow value by adding the scores obtained on the two subscales of the FSQ and the difference (change or delta [Δ]) scores for both positive- and negative affect by subtracting the post-aikido training scores from the baseline values obtained before the training. We

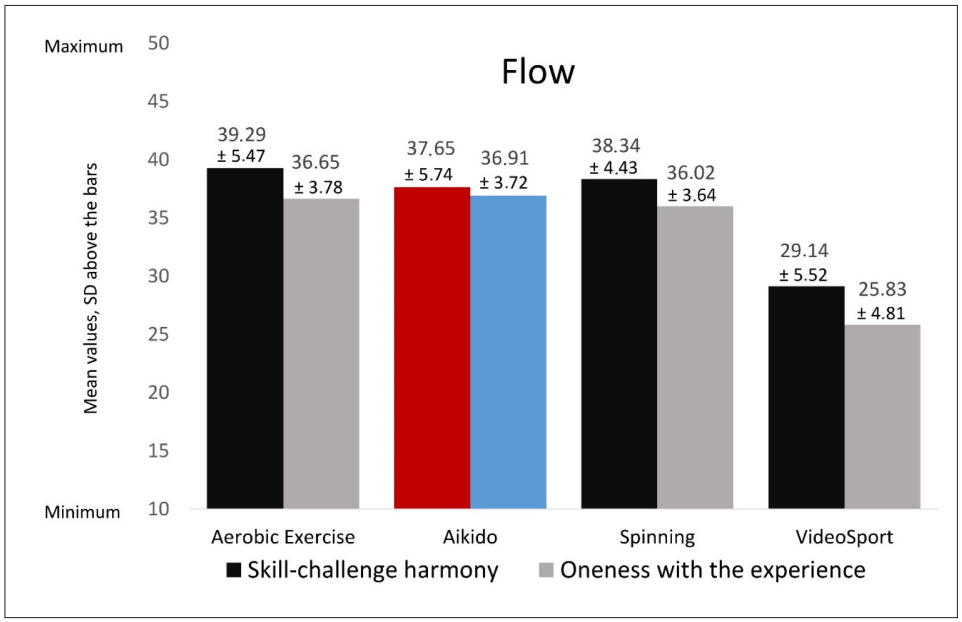

Figure. **Comparison of the flow experiences after three physical activities and video-sport games**

Note. The flow experiences reported in the current study are presented in colour and the means and the standard deviations appear above the bars. The aikido practitioners differed in both flow experiences from the video-sport game players, but not from aerobic- or spinning exercisers.

then examined the predictive power of the change scores, in both positive and negative affect, on the subjectively reported flow. The regression equation was statistically not significant ($p > .05$) as also reflected by the small R^2 value (.02) accounting for merely 2.0% of the shared variance between the magnitude of change in affect and the flow experience.

Finally, we tested the hypothesis that more experienced aikidoka will exhibit more favourable changes in affect and greater flow than less experienced practitioners by using a median split between the belt (reflecting experience) levels. While dichotomization is often criticized in the literature, the method is adequate (Iacobucci, Posavac, Kardes, Schneider, & Popovich, 2015) and serves well this purpose. Scores falling right on the median value were excluded from the dichotomization. Hypothesized differences in change scores in positive- and negative affect and reported flow between the two groups were compared with Mann-Whitney U tests. These tests revealed that the more experienced aikidoka scored higher on skill-challenge harmony ($Z = –2.27$, $p = .023$, effect size ETA squared based on McCall's (2018) Formula 5.15 ($\eta^2 = Z^2 / n = 0.10$ [0.0972]). There were no other statistically significant differences between the two groups.

DISCUSSION

The current research provides three new findings to the extant literature. First is that aikido training results in increased positive affect and decreased negative affect after training and, therefore, has an acute psychological benefit. The second is that a bout of aikido training is associated with flow experience comparable to other forms of physical activities that is greater than the flow reported after video-sport games. The third is that the subjective flow experience after aikido training is relatively independent of the favourable changes in the affective states resulting from aikido training. The study also expands a previous finding (Reguli et al., 2014) that experienced aikido practitioners may exhibit greater flow than their less experienced counterparts.

The finding that aikido training results in increased positive affect and decreased negative affect immediately after training, compared to a baseline before the training, is in accord with past research in other physical activities (i.e., Bikram yoga (Szabo et al., 2016); leisure swimming (Szabo et al., 2018); spinning (Szabo et al., 2015)). The changes were large as based on the effect sizes ($r = 0.5$ and 0.6, respectively, which correspond to Cohen's d values > 1.0; Rosenthal, 1994) indicating that although anticipation of an intervention (in this case the training) may affect the baseline (Calvo, Szabo, & Capafons, 1996), aikido still has a prominent effect on improving affect. Indeed, an issue and dilemma in pre- and post-intervention designs concerns the validity of the baseline immediately before the intervention because it may be contaminated by anticipation effects (Calvo et al., 1996). Accordingly, an inflated positive- and a deflated negative affect baseline could yield lower changes attributable to the intervention (in this case aikido training) than a true baseline taken – for example – in the morning after awakening the day before the research. Consequently, the actual change *vis-a-vis* a true baseline (unaffected by anticipation) could be expected to yield even more robust results than those observed in the current study, which were nevertheless very large already.

The current findings also demonstrate that aikido practitioners experience flow, in terms of skill-challenge harmony and oneness with the experience, during the aikido training. These findings are based on retrospective assessment, but there is no other option because flow would be interrupted due to distraction in any attempt of simultaneous measurement while the participant is engaged in an activity. The results also indicate that the reported flow is not related to the favorable changes in affect because the shared variance was merely around two percent (2%) between the magnitude of changes in positive- and negative affect and the reported flow experience. This finding also suggests that affect and flow are rather unrelated constructs. Despite the philosophical and spiritual nature of the aikido (Szabolcs et al., 2017) and the parallel drawn to the practice of mindfulness (Lukoff et al., 2017), the aikidoka did not report greater flow values on either subscale of the FSQ than aerobic- or spinning exercisers even though the data for the latter is based on relatively few observations (Szabo, 2018). This novel finding suggests that exercise in general triggers high skill-challenge harmony and oneness with the experience that may be independent of the philosophical antecedent of the activity. However, in different context of sport, like vide-sports dominated primarily by cognitive elements, flow is lower

than in tasks involving both somatic and cognitive constructs. Although, this argument warrants future research the difference observed between aikido practitioners and video-sport (snowboard and tennis) players may rather be attributed to personal choice and past experiences. In the study by Magyaródi et al. (2013) university students were presented with tasks that were not self-selected and probably most participants had no previous experience with them. In these circumstances it is more difficult to achieve flow than in aikido or other self-selected and regularly practiced physical activities, which is also conveyed by the results presented in Figure.

Our results lend support to the preliminary findings reported by Reguli et al. (2014), who provided tentative evidence for higher flow-experience at higher levels of aikido practice. However, differences emerged in skill-challenge harmony only but not in oneness with the experience. This new finding indicates that even at lower belt levels aikidoka can be highly absorbed in the experience while their skill-challenge harmony is self-evaluated to be lower than in the more experienced aikidoka, which is an expectable result directly linked to the appraised level of mastery essential in flow (Chen, 2007). Like the oneness with the experience, the magnitude of the changes in affect from pre- to post-training did not differ between the groups, reinforcing the affective benefits of aikido training at any level.

Limitations and strengths. The current sample may not be representative. Although no differences were found between men and women in any of the measures, a study with a larger sample size and more balanced female/male ratio is advised. The cultural homogeneity (Hungarians) of the aikidoka restricts generalizability across nations, but it should stimulate research in this context. Like in all pre- to post-intervention designs the adoption of a baseline before the intervention may be affected by anticipation effects, therefore future studies should employ a true baseline that can be assumed to be unaffected by the upcoming intervention. One noteworthy strength of the study is that it was conducted *in-situ*, which is in the aikidoka natural practice environment without modifying the circumstance of the training, which increases the external validity of the results. Another strength of the study is that its results are based on several assessments (at least three), which increases the reliability of the results. It should be noted that almost all pre- post-intervention studies, examining the psychological changes attributable to exercise, were based on singe before- and after-exercise assessments.

CONCLUSIONS

The current study reveals that aikido training triggers increases in positive affect and decreases in negative affect. These effects are large as based on the obtained effect sizes. These results are based on several (at least three) assessments before and after *in-situ* (real-life situation) aikido practice, thus they bear high external validity. Similarly, the average of several assessments indicates that aikidoka experience flow during practice the magnitude of which is not different from that reported in other forms of physical activities, such as aerobic- or spinning exercise. However, the flow experienced by the aikidoka is larger than the amount of flow reported after video-sport games. The subjectively experienced flow in aikido is independent of the magnitude of changes in positive- or negative affect. More experienced aikidoka experience greater skill-challenge harmony than less experienced martial artists, but the latter group reports as much absorption into the practice, via oneness with experience, as the more advanced aikido practitioners. These results, although preliminary, provide support for the acute psychological benefits of aikido and agree with the bulk of the results reported for other forms of physical activities.

Conflict of interest. The authors have no conflict of interest to declare.

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