

## Research Article

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# Biodanza Effects on Stress Reduction and Well-Being – A Review of Study Quality and Outcome

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**Abstract:** Biodanza is a new approach towards health and well-being. It aims to work with dance and group experiences to reinforce intra- and inter-individual resources, reduce stress and increase well-being. Up to 2016, 13 studies and one systematic review about Biodanza studies have been published. The Research Network BIONET was created in order to connect researchers and to find a consensus on the standards of good quality studies. In this review, the authors summarised seven Biodanza studies on stress reduction and well-being. The authors describe and create criteria to evaluate the quality of the research works inspired by international standards of clinical and social scientific intervention research. In several studies, Biodanza has an effect on impatience, ability to recover, feeling of activation, physiological sympathetic activity (e.g. heart rate, skin response), increased mood, feeling of well-being, immunological effectiveness on IgA and increased expression of emotion. One study also showed the effect on stress reduction. Also there was a large difference between those who choose Biodanza (they have a significant lower status of stress reduction) and the other groups. In this study, the dropout rate was high (42%); in the other studies, it was under 10%.

**Keywords:** Biodanza, stress reduction, well-being, health, dance, yoga, review, methodology, body work, study design.

## Introduction

The Biodanza method was developed by Rolando Toro in the 1960s. Toro's aim was that people learn how to live well and happily together. As Seeligman (2002), the founder of positive psychology, said, 'when people are happy, then they are healthy, feel well and learn to reduce their stress' (Seeligman, 2002). The method of Biodanza works with dances, music and group experiences. Biodanza is a method which stimulates autoregulation and is based on the concept of human integration on a personal, interpersonal and transcendental level. Empirical Biodanza research on its effects started in the 1990s. The first 'classic' empirical quantitative study on stress, well-being and Biodanza was undertaken by a German-Argentinian research group in Argentina (Marcus Stueck, Alejandra Villegas, Rolando Toro, Raul Terren, Veronica Toro and others, 1997–1999). Stueck and Villegas (2008) developed a masterplan of Biodanza research with eight aspects and started further on to investigate Biodanza scientifically at Leipzig University:

1. **Development and updating of the theoretical model of Biodanza** (Stueck, 2007)
2. **Experimental basic research** (since 1998, e.g. Stueck 2014: 'Effects of caress', Balzer, Stueck (2009): 'Hypersensitivity of the skin', Khalifa et al., 2003, Balzer, 2010: "laboratory research about effects of music on stress reduction")

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3. **Quasi-experimental studies in weekly Biodanza classes** (since 1998, 14 published studies, see 3): Until now in different quasi-experimental studies, it was demonstrated that Biodanza has an effect on the physiological and psychoimmunological system and what is the special effect of Biodanza (e.g. emotional expression i.e. 'transtase-effect') in comparison with control groups with yoga (Villegas, Stueck et al. 1999, 2000, Villegas, 2006, Stueck, Villegas, 2004, 2007, 2008, 2009). Based on the biological changes, Biodanza improves the psychological parameters (higher optimism, relaxation, self-efficacy, ability of love and empathy, reduced stress, anxiety (Villegas 2006/2008; Stueck, 2007/2008, 2012; Giannelli, Giannino, Mingarelli, 2016).
4. **Research on Extension of Biodanza** (Effects of Biodanza Aquatica on stress reduction and well-being, since 2006, Stueck, Villegas, 2010)
5. **Cross-cultural studies of Biodanza** (since 2005, Argentina, Tanzania, Stueck, Villegas, 2010)
6. **Studies on the quality of Biodanza teacher-training** (since 2003, Stueck, Villegas, 2010),
7. **Biodanza with children** (since 2008, evidence-based Biodanza and reduction of cortisol in relation to the ability to recognise emotions in 4- to 6-year-old children, Stueck et al. 2016, Effects of Biodanza on Immunglobuline A and Testosteron, Stueck et al. 2014, Effects of TANZPRO Biodanza in schools, Greaves, Stueck, Svence, 2016) and
8. **Publications (since 1999)**. In the mean time and up until 2016, 13 studies and one systematic review about Biodanza studies (Stueck, Villegas, 2008) have been undertaken and published, 10 of which were done at Leipzig University. One was performed in Portugal, one in Italy and one in Brazil. In the coming years, it is likely that there will be an increasing number of articles, which is why the Research Network BIONET in cooperation with the IBF Research department and universities was founded in order to connect the researchers and to find a consensus on the standards of good quality studies, which could then be published in peer-reviewed international journals. Until now, there have been only a few studies in peer-reviewed journals, where 'blinded' scientists review the study. There are two external PhDs and one professorial dissertation that looked at and rated the quality of the study. Such an external rating is necessary to secure high and valid scientific quality in order to be accepted by institutions, for example Biodanza projects by ministries. An overview about the worldwide research works is given in the *Bionet Journal* 2012 (see [www.bionet.name](http://www.bionet.name)). Furthermore, in this article the methodological quality, concerning methods, statistical analysis of the quantitative Biodanza studies (qualitative standards should be discussed in a further article) is discussed and standardised criteria developed for such studies based on the standard of empirical science. Klauer (2001) named five criteria, which need to be considered in the training evaluation: **(1) intensity of the effect** (the statistical analysis should be done by using multiple comparison measurements (e.g. MANOVA, testing the g+t-effect, to interpret the effect, effect size and power  $1 - \beta$  should be used). Using only significance testing is not enough, because then more subjects you have than more easier you get an significant effect, which is not correct. After using more than one post-hoc test with the same data material, it is important to do the Bonferoni adjustment. It means to divide the  $p$ -value by the number of post-hoc tests, e.g. in a Pre-Post1 follow-up design analysed with MANOVA and followed by LSD post-hoc tests to estimate the effects between the measurement times. It's a total of three tests plus the  $t$ -test for calculating the homogeneity between two groups. The significance value of .05 is decreased to  $.05/4=0.012$  (statistical tendency= $.10/4=0.025$ ) (MANOVA); **(2) persistence of the effect** (e.g. a follow-up measurement, Post 2 is necessary and the control of the drop-out rate), e.g. in a training evaluation, short-term effect should be measured of the training=Pre-Post1, a long-term effect=Pre-Post2 and a after training effect=Post1-Post2; **(3) transfer of the effect** (how the training effects get a meaning in the daily life); **(4) shutting out of externally influenced changes**: it means that there should be a control of disturbance variable through control group (CG), which has homogeneous pre-values; **(5) stable validity of the applied diagnostics** (Cronbach's alpha). Borz and Döring (2002) named the fundamental examination work designs, which we followed in the Biodanza studies. When Marcus Stueck, Alejandra Villegas and colleagues started together with Rolando Toro to investigate Biodanza in 1998, there were no studies done before, so that they started off with an explorative question-generating study (Villegas, Stueck et al., 1999) and summative and formative evaluations (Villegas, 2006), especially with some physiological

measurements. During Biodanza sessions, they did case studies or one-shot studies (Stueck, Villegas, 2008). Later, after all the first findings, it was possible to generate a hypothesis (hypothesis-verifying investigations, Stueck, 2007).

There are two main approaches to investigate and to design clinical studies:

(1) The optimal classic double-blind randomised controlled trial (DB-RCT) uses one or more *control groups*; the treated group is compared to the control groups (placebo or another treatment) using various outcome criteria. The study design is blinded, which means the participant does not know to which group he belongs to. The subjects are randomised. Homogeneity (matching between the groups is guaranteed). When randomisation is not possible, then the pre-values of the groups may not be matched (loss of homogeneity in the pre-values). However, homogeneity can be enforced by choosing the participants who enter the control groups and should be confirmed in the analysis (e.g. *t*-test for independent samples  $p \geq .05$ ).

(2) A second approach is to decide, in advance of the analysis, on a small number of variables which will be analysed; then the power is not reduced by a Bonferroni correction. In the Biodanza or body-therapy studies, we are forced away from the DB-RCT design, principally because blinding is impossible (for both therapist and subject). In addition, subjects may not be randomly allocated to groups. Nevertheless, academic studies in areas such as cognitive-based therapy (CBT), physiotherapy and well-being have produced results that are respected. In Germany and the UK, CBT is now funded by the state (National Health Service), and this may give us a model for how to demonstrate objectively to state-funded bodies the efficacy of ‘treatments’ such as Biodanza.

Hager and Hasselhorn (2000) stated that studies on psychological interventions should have three goals: **(1) General Goals** (general questions), e.g. does Biodanza reduce stress? **(2) Special Goals** (specific hypothesis). Biodanza reduces the ‘inability to recover’. It is necessary to define statistical criteria when the goal is reached. The criteria should include effect size, power ( $1 - \beta$ ) and significance ( $p$ ). Even if significance is not reached ( $p \geq 0.05$ ), the hypothesis can be verified from the effect and power values. For the effect factors, the scientific conventions for *t*-tests apply: small effect = 0.20, average effect = 0.50 and big effect = 0.80. For MANOVA: small effect = 0.10, average effect = 0.30 and big effect = 0.50. For power, the conventions given in Faul and Erdfelder (1992) apply: small power = .20 to .50 average power = .50 to .80 and big power  $\geq .80$ . This is related to the sample size. In general, then larger the sample then the better the significance level. That’s why the power is needed as an additional criterion. **(3) Facultative goals** (e.g. satisfaction with the intervention).

In addition, two types of evaluations are done: **(a) effect evaluation** (Before=Pre-Training, immediately after the final session=Post1, Post2=follow-up, the delay between Post1 and Post 2 should be the same as the duration of the training); **(b) process evaluation** (effect of each individual session, e.g. pulse measurements before and after session, Stueck, 2007). Concerning the effect evaluation, Hager and Hasselhorn (2000) named four prototypical successful measures of intervention, which are used in the frame of a control group design with three given moments for the gathering of information to verify a push in the development of the competence:

**Type 1 (successful intervention):** An increase in the difference of performance between control group and experimental Group is noted. This difference in the performance persists until after the follow-up. This is the evidence of an intervention-dependent increase of performance with a timely transfer and ultimately a successful increase of competence without any additional push in development.

**Type 2 (ideal model):** There is an increase in performance between pre- and post1- measurement time and between post1- and post2- measurement time, which suggests a successful increase of competence without any additional push in the development.

**Type 3 (desirable scenario):** The performance is constant between pre- and post1 measurement time but starts to increase between post1 and post2 measurement times, which suggests a long-term push in the development.

**Type 4 (successful measure of intervention):** The difference in performance between the two groups increases between the pre- and the post1- time of measurement only to decrease again, so that no post2-difference is to be found and no long-term maintenance of the increase in performance is to be expected. This means that the short-term competences (K- competences) change whereas the long-term competences (L- competences) do not.

Out of the theory there can be developed evaluation criteria for effect and process evaluation.

Thus when evaluating a published study, or designing a new one, the principal areas that require attention are the following:

1. Are there general, specific and facultative objectives that can be formulated and proved?
2. Is the content of the intervention in the Biodanza groups and control groups described (session wise)?
3. Choice of subjects: – can be random or specifically those expected to benefit from the treatment mechanism. Did the experimental group use Biodanza before? It has to be a new `naive` group.
4. Choice of control groups: (which of the effects of bodywork are you trying to control for? e.g. the physical exercise aspect?). Matching of control groups: is the amount of therapist intervention similar in all groups?
5. Study design: Identification of outcome variables and measurement time points (Pre Post 1-measurement + Post 2-stabilisation effect, follow-up)
6. Instrument data collection: information about the validity of the instrument (Cronbach alpha).
7. Maximising retention, particularly in a long study. Why do some leave? The drop-out rate should be controlled. If not, the remaining subjects are not typical of the starting group; they may show increased persistence or treatment efficacy (for them, the treatment is working, that's why they are staying)
8. Data analysis, including statistical procedure, e.g. significance testing (e.g. MANOVA), effect size ( $d$ )/ Power ( $1 - \beta$ ), confounding variables and Bonferroni correction.
9. Pre-condition for data interpretation: Is there a Pre-Value-homogeneity?
10. Discussion: separation of results and discussion. Discussion should be regardless of emotional attachment to one treatment (critical reflexion) based on an interpretation model (Hager-Hasselhorn, see Figure 1) or conclusion towards the general objectives (question), special objectives (hypothesis), facultative objectives (satisfaction with intervention). Is there a description of criteria of answering hypothesis?
11. Can be the quantitative data interpreted by also using qualitative data?

## Aim of the Study

The aim of this article is to summarise and review the quality of the research in Biodanza concerning stress and well-being in an meta-analysis and systematic review. We selected seven quasi-experimental studies of weekly Biodanza classes (since 1998). An overview about the current standards of therapy research study design should be given as a conclusion. It will be a model for future investigations in Biodanza. The following questions should be answered: 1. Does Biodanza have an effect on stress reduction? 2. Does Biodanza have an effect on emotional regulation? 3. Does Biodanza have an effect on well-being and health-correlated biological variables?

## Materials and Methods

A total of seven studies concerning stress and well-being are investigated and summarised. The three areas 'stress response vs. relaxation response,' 'well-being' and 'emotional expression' were investigated. The use of the criteria (1–9) was evaluated and the outcomes of the studies were compared.

Study 1: Investigations in Buenos Aires to study the health psychological and physiological effects of Biodanza (Villegas, A., Stueck, M. et al.; 1999, 2000, Stueck, Villegas, 2008). The studies in Buenos Aires took place at the Universidad Abierta Interamericana. Experimental group (EG, Biodanza  $n=27$ ) and a control group (CG, discussion class  $n=23$ ).

Study 2: Repetition of the study in Buenos Aires in Leipzig: (PhD Alejandra Villegas, University of Leipzig, Villegas, 2006). The research in Argentina was repeated in Leipzig with the same research design (experimental group (EG, Biodanza  $n=36$ ) and a control group (CG, Latino Aerobic  $n=20$ ).

Study 3: Biodanza with teachers, professorial dissertation (Habilitation, Stueck, 2007). (Experimental group (EG, Biodanza  $n=29$ ) and a control group (CG, Yoga  $n=38$ ).

**Study 4:** Nine months study of Biodanza groups (Giannelli, Giannino, Mingarelli, 2016). (EG;  $n=96$  Biodanza; CG1,  $n=71$  Physical Activity Tango; Latin American dances, CG2  $n=68$  no physical activity). All investigated groups (except CG1, study 6 / 86.76% were done with beginners, i.e. new “naïve” participants).

**Study 5:** Biodanza and psycho-vegetative stress states. 24-hour monitoring of sympathetic activations on skin resistance before and after the 10-week intervention (EG, Biodanza  $n=8$ ) and a control group (CG, Yoga  $n=8$ ). (Stueck, Villegas, Perche, Balzer, 2007).

**Study 6:** Psycho-Immunological Process Evaluation of Biodanza. (EG, Biodanza  $n=13$ ) and a control group (CG, Yoga  $n=11$ ) (Stueck; Villegas; Bauer; Terren; Toro; Sack, 2009).

**Study 7:** Comparison of the sympathetic activation the day before and after Biodanza intervention (Stueck, Villegas, 2008) ( $n=104$ ) In total, 552 subjects were investigated. The drop-out rates in studies 1, 2, 3, 5, 6 and 7 were under 10%. In study 4, the drop-out rate was 42%. Studies 1–5 are studies with effect evaluation (pre-post Measurements + follow-up, except in study 4). In studies 1, 2, 3, 6 and 7, a process evaluation (measurement of sessions) was also done. The following variables were analysed:

1. **Area ‘stress reduction and relaxation’:** ‘Relaxation and calmness’ (Study 1, 2 and 3), ‘inability to recover’ (Study 2 and 3), ‘stress reduction’ (Study 4), ‘physiological distribution of relaxation-activity’ (Study 5), ‘feeling of activity’ (study 6), ‘heart rate (HR)’ (Study 3) and ‘physiological activity after Biodanza’ (study 7).
2. **Area ‘Emotion regulation and expression of emotion’:** ‘Mood’, emotional descriptions after Biodanza, Alixethymia
3. **Area ‘Well-being’:** ‘Well-being before and after sessions’; ‘Well-being before and after training’.

## Results

The results in the areas are showed by describing the general outcomes of the studies. The statistical outcomes are introduced in the appendix.

### Area: ‘stress reduction and relaxation’

We analysed four studies (1, 2, 3 and 4) with effect-evaluation, where the stress response vs. relaxation response was measured by using questionnaires (see appendix). We included five studies with process evaluation (1, 2, 3, 5 and 7).

**Effect-Variable ‘Relaxation and Calmness’ (Study 1, 2 and 3):** There were significant effects in the Post 1 and follow-up measurement times (except in study 1) between EG and CG. The problem is that the statistical analyses were inhomogeneous to compare the results between the studies properly. In study 1,  $t$ -tests were used for dependent samples between a cut of value (this corresponds to a mean score of 4, i.e. no change) and the groups; in study 2, the outcome was measured between the groups in Post 1 and 2. In study 3, the effect by using MANOVA and analysing the differences between the groups and Bonferoni adjustment was estimated. Only in this study, the effect size  $d'$  was also calculated. At least in studies 2 and 3 the power was estimated. The pre-value homogeneity was not tested between experimental and control group ( $p \geq .05$ ) in all the three studies, because it was a retrospective diagnostic to Post 1 and 2. Here the randomisation would have been necessary but it was not done. Because of this, it is not possible to conclude that the change in Post 1 or 2 is because of Biodanza or has another reason (e.g. placebo). No type estimation (Hager, Hasselhorn) is possible.

**Effect-Variable “Inability to recover” (study 1, 2 and 3):** The pre-homogeneity ( $t$ -test independent samples) was tested here. A significant tendency of short-term decrease towards ability to recover after 10 weeks of Biodanza and after Bonferoni-adjustment with a medium effect size was found. Biodanza may have a weak effect on the ‘desirable intervention on the variable ‘inability to recover’ (type 3 model).

**Effect-Variable “Impatience” (study 2 and 3):** There are significant reductions in studies 2 and 3 in the variable “impatience” (long-term: Pre-Post 2). In study 3, a Bonferoni Adjustment was calculated while it was

not done in study 2. Therefore these two studies cannot be compared. Because the follow-up measurement showed an effect, but not Post 1, Biodanza may have a weak effect on the ‘desirable intervention on variable ‘impatience’ (Typ 3 model).

**Effect-Variable ‘stress reduction’ (Study 4):** There is no increase of stress reduction in the Biodanza group in comparison to the two control groups (physical exercise/latin and sedentary group) as the authors note. The study shows that more stressed people prefer Biodanza. The Biodanza group did show a large improvement in various stress reduction scores (as the study organisers had hoped); however, detailed analyses in the article 4 showed that the Biodanzers started the study with lower stress reduction scores, and at the end had improved to reach the values of the other groups; in contrast, the other groups showed little change. In this study age and gender is matched, but not the psychological scores (stress reduction). The idea of the control is to prove if the Biodanza intervention is better than the physical intervention or doing nothing. With this study design, with no pre-homogeneity, the effect of the Biodanza intervention is not shown, but the possibly effect of just being in a group (it could be a placebo effect and to exclude placebo, you need the control group, which starts from the same pre-level of well-being). The authors concluded that ‘the results of the research support the hypothesis that Biodanza is actually a practice for the promotion of health, in as much as those who participate on a regular basis for about a year, demonstrate an increase of psychological well-being and a decrease in stress and alexithymia’ (see 4.2). This rather general statement is not justified. It blurs the distinction between those who choose to complete the Biodanza, and the general population (the retention rate is 58% (drop-out 42%) is too high to make this general conclusion). The effect size  $d'$  and the power ( $1 - \beta$ ) was not estimated. In our observation, we found that 14% of the CG1 had experience with the TANGO/Latin dances before. There is no Post2 measurement time. That’s why it is not possible to estimate the type of intervention outcome.

**Effect-Variable ‘physiological distribution of relaxation-activity’ (Study 5):** The results in a 24-hour skin resistance monitoring after the 10-week-intervention in EG 1 show in the Biodanza and Yoga group, a decrease of the psycho-physiological activation conditions (Power  $\geq .80$ , Effect size  $\geq .50$ ) is observed. Moreover, a better activity-relaxation-synchronizing of the basic rest-activity cycles (BRAC<sup>1</sup>) due to Yoga and Biodanza was found. The optimal activation–deactivation-synchronisation is a condition for health, well-being and auto-regulative aspect of stress coping. Compared with Yoga, Biodanza is not especially effective for relaxation. There is no follow-up measurement, and so it is not possible to estimate the type of intervention outcome. The effect size and power ( $1 - \beta$ ) was estimated.

**Process-Variable ‘Relaxation Activity’ (Study 1, 2, 3 and 7):**

*Activity:* Biodanza has a significant effect on the increase of the group-mean of subjective feeling to be more active (fresh, awake, active, amusing, ready to work) (after 23 out of 30 sessions), compared to control group (discussion group, 1 sign. decrease) or Latino Aerobic (1 sign. increase of activation) and Yoga (4 sign. changes). This activation effect of Biodanza could be proved by the sign increase of the sympathetic activation (P%) between the day before and after Biodanza. The subjects (group mean) had more activation states and less stress inhibition mechanisms (overloaded inhibition). Here the effect size was estimated but not the power and there was no comparison to a control group (see study 7).

*Relaxation:* Biodanza has similar effects on group mean (after 18 out of 20 sessions, 18 sign. increased relaxation-values; calm, relax, balanced, serene) as Yoga and Latino Aerobic (15 sign. increased relaxation-values) on the subjective feeling of relaxation. In study 3, ten Biodanza and 10 Yoga improvements were seen. These results show that the particular investigated Biodanza classes has no specific effects on relaxation.

**Process-Variable ‘heart rate (HR)’ (Study 3):** Biodanza has a HR-activating effect and Yoga has a HR-deactivating effect. Participants start with significant higher ‘pulse values’ than Yoga participants and finished after 10 sessions at the same level. The effect size and power were estimated. This result shows that the different effect mechanisms reach autoregulation, which means that they start with different HR and by the end, they finish at the same mean HR as the Yoga.

<sup>1</sup> BRAC-activity rhythm (120 min), where after 67% of the time excitation and 33% of the time relaxation is the optimal synchronization or balance between vegetative-emotional stress and relaxation (Balzer, 2002).

## Area: ‘Emotion regulation and expressing feelings’

We analysed five studies, where the variable ‘emotion regulation and expressing feelings’ was psychologically measured.

**Effect variable ‘Alixethymia’ (Study 4):** The Alexithymia score decreased in the Biodanza group, reaching the values of the other two groups; this had a tendency to be significant. There is no Post2 measurement time. The same problems in study design and analysis as mentioned in Study 4.1 can be reported. More people with problems with respect to expression of emotions were coming to Biodanza and not that Biodanza has an effect on alexithymia. That’s why it is not possible to estimate the type of intervention outcome. There is no follow-up and no effect size and power ( $1 - \beta$ ).

**Process-Variable ‘Mood’ (Study 1, 2 and 3):** Biodanza has a mood-specific effect (towards joyful, cheerful and happy) (after 22 out of 30 sessions) compared to control group (discussion group, 1 sign. decrease) or Latino Aerobic (3 sign. increase of activation) and Yoga (3 sign. increases).

**Process-Variable ‘emotional descriptions after Biodanza’ (Study 2):** In interviews after the end of each out of 10 sessions, the participants were asked about feelings (How do you feel?). The results showed that there was a much more differentiated description of feelings in the EG (Biodanza) in comparison to CG (Latino Aerobic): The average number of positive descriptions was in the EG (58.8%) much higher than in the CG (19.5%). Also the negative statements for experimental group (21%) and control group (10.3%) were different.

## Area: Well-being and health-correlated biological changes

**Effect-Variable ‘well-being’ (Study 4):** The participants in Biodanza, after 9 months, improved their levels of well-being. This result cannot be compared to the control group and cannot be generalised as an effect of Biodanza (see 4.1). Again it shows only that more of those people who feel less well go to Biodanza. That’s why it is not possible to estimate the type of intervention outcome. There is no follow-up and no effect size and power ( $1 - \beta$ ).

**Process-variable ‘well-being’ (Study 1 and 2):** In the EG, after 10 sessions, there were sign. group mean improvements of well-being. In the CG were two significant tendencies (disimprovements, one significant improvement, one improvement of the well-being).

**Process-variable (Immunoglobulin A) (Study 5):** Both groups (Biodanza and Yoga) has six significant decreases of IgA. This changes correlates to the relaxation changes in Study 3. The Biodanza specific effect shows that in Biodanza from the session 7 onwards the pre-values of IgA differ from the pre-values from session 1–6. This ‘jump’ is not seen in the CG.

## Conclusion

What are the specific effects of Biodanza classes compared to control groups? On stress reduction and taking into consideration of all the methodical limitations, there are a few Biodanza-specific effects:

- Decrease of impatience (long term) and decrease of the inability to recover (short term). Impatience is the accompanying emotion if a person is under time pressure and it correlates to heart disease.
- Increased feeling of activation (more awake, fresh, amused, ready to work) after Biodanza (study 1,2,3). This finding can be supported by the finding in study 7, where sympathetic activation increases significantly in the day after Biodanza without using stress inhibition mechanisms. This could be a physiological factor to prevent burnout (Stueck, Balzer, 2002).
- Activation of heart rate (HR) compared to Yoga (deactivation, Study 3).
- Increase in mood cheerfulness, joy and well-being (4.3) after the Biodanza classes in study 1, 2 and 3 (4.2). Also the increase of the average number of positive descriptions of feelings and the higher average amount of negative feeling description after Biodanza shows a specific effect, whereas Biodanza seems to be a method where a person gets in contact and learns to express them without guilt.

- Increase of the IgA pre-values from the seventh session onwards (study 6, 4.3). This could be a result of an increased ability to express emotions (4.2). The immune system is possibly more effective because emotions are not held back anymore. This aspect should be investigated and the experiment should be repeated.

Some effects are also observed in the control groups:

- Between Yoga and Biodanza, similar effects related to the optimum between activation and deactivation in the BRAC-Rhythm (study 7). The heart rate (HR) before the Biodanza class in study 3 shows that Yoga and Biodanza groups started from completely different levels and ended up in the same HR (same vegetative working point). Here it is important that the authors documented the exercises (activation circle) because they influence HR. Only in studies 1, 2, 3, 5, 6 and 7 the exact Biodanza exercises were described, and not in study 4. The activities of the control groups were not described at all in all studies.
- Similar effects concerning subjective feelings of relaxation after the sessions in Biodanza and Yoga.

In study design, there have been poor choices of control groups and poor interpretation in the analysis:

- Study 4 gives no contribution whether Biodanza reduces stress, well-being or changing expression of emotions because the pre-homogeneity was not tested. The authors of study 6 concluded that ‘the results support the hypothesis that Biodanza .... promotes health, in as much as those who participate ... demonstrate an increase of well-being and a decrease in stress and Alexithymia’ (Giannelli, Giannino, Mingarelli, 2016). In fact, this rather general statement is not justified. This study shows that more stressed persons, persons with a reduced well-being score and with problems to express feelings come to Biodanza. This is an important outcome because it gives more insight into the target group of Biodanza. It was also found by Stueck and Villegas (2008) that there were differences in the personalities between Biodanza and the aerobic group (people who started with Biodanza had a sign and lower scores of mental well-being and self-actualization scores).
- Generally there should be a more critical view on the results in Biodanza (also study 4).
- Also there must be a proof of the stabilisation of the effects after the treatment is finished (follow-up measurement in the effect evaluations). In the effect evaluation, this was not considered in studies 4 and 5.
- As well as the selection of samples. All studies should be done with beginners. Studies 1–3 did it completely. In study 4, 14% of the control group had Tango/Dance before. That is a mistake because you cannot control the amount of pre-experience and its effect on the results.

Referring to the criteria (3)

- Only in study 3 Bonferoni adjustment was done (not in study 1 and 2; study 4 did not need it). This reduces the sensitivity of the study.
- Randomisation of groups is probably the hardest issue to address, yet it is crucial if those who volunteer for Biodanza are not typical of the general population. Related to this, groups should be supported to achieve good retention rates. The retention rate of study 4 is too low (58%, in studies 1, 2, 3, 5, 6 and 7, it is  $\geq 90\%$ ).
- The analysis and language have to clearly see Biodanza as a potential helpful therapy, without any pre-judgement about how well it will perform. For those trained in Biodanza, this is an important step; it is essential to be intellectually distanced from Biodanza when making the analysis and discussion.
- By choosing subjects who are more likely to benefit from the Biodanza intervention, effect size and statistical significance will probably improve and be achievable with small numbers.
- Each intervention should be clearly described. With the existing material, a meta-analysis cannot be done because in some of the studies important indices are missing. Meta-analysis can only proceed if we are able to identify a common statistical measure that is shared among studies, called the effect size ( $d^*$ ) or power ( $1 - \beta$ ), which has a standard error so that we can proceed with computing a weighted average of that common measure. Such weighting usually takes into consideration the sample sizes of the individual studies.



- What are the effect mechanisms behind the general result in the pre-post studies? It is may be necessary to investigate, for example, physiologically a smaller group of Biodanza compared to a control groups.
- To make a general conclusion about an investigated area as well-being and stress reduction, researchers need to conduct repeated studies on the same topic. It is necessary to investigate using an interdisciplinary and multi-methodological approach. It is not credible to make the general statement that Biodanza has an effect on well-being and stress reduction after one study with questionnaires. Because well-being and stress reduction are (according to the Biodanza theory) first of all a biological process embedded in social contexts and with psychological effects. It is necessary to understand the biological mechanisms behind the actual effects of Biodanza (Toro, cit. in Stueck, Toro, Villegas, 2010).

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