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A Group-based Wellness Intervention in the Laboratory

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A Group-based Wellness Intervention in the Laboratory*

Gary B. Charness and Roger Jahnke

Abstract

The enormous cost of health care in the United States has sparked increasing interest in innovative and alternative approaches to both physical and emotional wellness. We demonstrate the value of an easy-to-implement, stress-reducing and wellness-enhancing methodology. In our study, undergraduate students who participated in a weekly meeting over the course of two months had, relative to a control group, a significant decrease in the resting-pulse rate over time, as well as significant improvement in several measures of wellness. Our results suggest that simple lifestyle-oriented wellness-promotion interventions may have significant benefits in terms of increasing health and productivity, as well as diminished medical costs.

KEYWORDS: Wellness, health intervention, medical costs, experiment

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Introduction

The Center for Disease Control and Prevention (2008) estimates that 75% of all medical costs are for the treatment of preventable chronic disorders. Ali et al. (2004) find that nine out of the 10 major causes of death are preventable, at least in the short run.[1] Expenditures on health care in the United States surpassed $2 trillion in 2006, almost three times the $714 billion spent in 1990, and over eight times the $253 billion spent in 1980.[2] As preventing disorders seems considerably more desirable than treating disorders, exploring preventative options offers considerable economic promise.

Given the radical growth in costs, health care and medicine are in a much-needed re-engineering process. With these significant pressures in the health-care system there has been a rapid and high-magnitude increase of interest in disease prevention and in programs that promote health and personal productivity. Some of these studies involve the use of explicit financial performance incentives for people to explore and engage in health-promoting behaviors. For example, Fernald, Hou, and Gertler (2008) perform an intervention with low-income, rural, Mexican adults, who received money contingent on positive changes in health behavior. Their results indicate significantly improved biometric measures for those in the intervention communities than for those in the control communities. Giné, Karlan and Zinman (2010) report a positive effect from offering cigarette smokers savings accounts in which they deposited funds over six months, after which participants would take a urine test for nicotine; if they failed, the money would be forfeited.

Another approach is to pay people to simply attend sessions for a fixed rate of pay. Charness and Gneezy (2009) paid students at two universities to attend the gym nine times over a one-month period. After the payment period was over, they found significant improvement in gym-attendance rates; in addition, they found evidence of significant relative improvement in a number of biometric measures for the paid group as compared to the control group. Thus, it does not appear to be necessary to provide financial incentives based on measured performance to reap benefits from an intervention. In our study, we follow this approach and simply pay people in our intervention group for attending nine weekly sessions.[3]

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[1] It was a bit of a surprise when conventional medicine itself was found to be the third-leading cause of death in America (Weingart et al. 2000).

[2] These figures are taken from Kaiser Foundation (2008), at http://www.kaiseredu.org/topics_im.asp?imID=1&parentID=61&id=358.

[3] The essential results of this article have now been replicated in a number of other controlled studies. See, for example, Acland and Levy (2009) and Babcock, Bedard, Charness, Hartman, and Royer (2010).

An alternative to a purely physiologically-based approach for effecting behavioral change is to purposefully activate and enhance the mind-body interface, the interaction of the psychological and physiological processes of the individual. An appreciable proportion of the enormous amount of money spent each year on the treatment of preventable diseases may be avoidable by teaching people about health self-reliance and encouraging the use of self-healing and stress mastery skills. It is widely understood that mind-body interventions like lifestyle planning, wellness coaching, behavioral change management and mind-body practices like Yoga, Tai Chi, meditation and Qigong have significant benefits on the promotion of well-being and the management and prevention of disease (Tindle et al. 2005; Wolsko et al. 2004). Behavioral interventions, even mild and routine exercise, have been found to have benefits that are equal to or better than drugs. One study found that exercise is as effective as pharmaceutical approaches to depression (Science Daily 1999). Another found that the association between depressive symptoms and adverse cardiovascular events was largely explained by behavioral factors, particularly physical inactivity – physical activity is a remedial strategy for preventing depression and heart attacks (Whooley et al. 2008).

While an approach to wellness has not been the focus of many studies in economics, there is a rich base of literature that suggests that the economic benefits of health promotion are worthy of pursuit and that the return on investment on such programs is favorable. Potential benefits of wellness/health programs include lower costs for health care or insurance premiums, higher morale, and greater productivity. For example, studies by Goetzler and Ozminkowski (2008) and Aldana (2001) have suggested that, on average, more than $3 can be saved for every $1 spent an average; we discuss this issue further in section 4.2. James Heckman has written on the importance of developing both cognitive and socio-economic skills for maintaining both physical and mental health.[4] Respected physicians have written books extolling the benefits of cognitive-behavioral therapy (as apposed to medication) for depression and anxiety (Burns 1999), stressing the connection between emotions, wellness, and musculoskeletal pain (Sarno 1998), demonstrating that heart disease is reversible (Ornish 1990), and asserting that numerous medical conditions can be successfully treated and even prevented without drugs or surgery.

This paper reports the results of an intervention under controlled conditions. The intent of our investigation was to demonstrate a tangible benefit either in attitudes towards wellness or in wellness outcomes *per se*. We facilitated students in a mind-body based wellness program, including comprehensive

[4] See, for example Heckman and Rubinstein (2001), Heckman, Stixrud & Urzua (2006) and Heckman (2008).

lifestyle planning and simple mind-body practices, in weekly meetings over a two-month period. Our goal was to investigate how individuals respond to information about wellness and to experiences with self-initiated health-enhancing practices, with the facilitation of a trained health and wellness coach. The intervention explored the use of a 'toolbox' of processes for enabling relaxation and stress reduction, enhancing personal energy, and expanding capacity for mental focus and learning. Our paper appears to be the first study in the economics literature on a more holistic wellness approach.

The overall design of the intervention included wellness coaching and lifestyle planning with a focus on mind-body practice using a widely-respected, personal-assets-based health and wellness coaching methodology – The Circle of Life. In the coaching context, participants explored their areas of personal strength as well as areas they might wish to target for improvement. With guidance from the coaches they created and pursued both short and long term goals through personal lifestyle plans. The mind-body practices included breath practice, self-massage, light meditation, and simple, low stress body movements. Participants completed a questionnaire concerning their habits, attitudes and stress levels at the first and last sessions. In addition, we measured resting pulse rates at the beginning and end of both the first and last session.[5] We presume that lower pulse rates (at least above 50 beats per minute) are better than higher pulse rates, even though this may not always be the case.[6]

We did not expect to find significant biometric effects with a young and healthy group of participants (undergraduates at UCSB), but thought we might see improvements in attitudes towards wellness activities. However, we did indeed find evidence of significant reductions in pulse rate relative to the control group that was not exposed to the wellness program or the mind-body practices. The questionnaire results were more mixed, but nevertheless provided evidence of improved attitudes towards individual responsibility for health and wellness and better experiences over the two-month span with respect to depression, sleep difficulties, etc.

[5] Resting heart rate, an indicator of autonomic nervous system tone, independently predicts coronary events in men (Kannel, Kannel, Paffenbarger, and Cupples 1987, Palatini and Julius 1997, King, Everett, Mainous, and Liszka 2006, Thayer and Lane 2007) and women (Hsia, Larson, Ockene, Sarto, Allison, Hendrix, Robinson, LaCroix, and Manson 2009).

[6] In any case, a 10 beats-per-minute difference in pulse rates means a difference of 14,400 heartbeats in a day, or 4,838,400 heartbeats in a year. While people with a higher pulse rate may be completely healthy, on average it still seems better to have a lower resting pulse rate.

1. Study Design

We recruited participants from a database consisting of students at the University of California at Santa Barbara who had expressed interest in participating in paid research experiments. This database was composed of people responding to a campus-wide e-mail message inviting people to register on a website for possible participation in research studies. As this notice was campus-wide, a great variety of academic majors were represented.

Invitations were sent by e-mail to potential participants, and respondents were assigned to one of two introductory meetings via the random choice of the e-mail invitation received. These invitations mentioned attendance over multiple sessions, with earnings in line with the typical pay (which is around $12-15 per hour) for experiments at UCSB. People who attended the introductory meeting for the control group were told that they would be paid $10 for coming to this introductory meeting and $15 for returning for final session eight weeks later) and that these sessions would take 45 minutes or less. People who attended the introductory meeting for the group to be trained in mind-body practices were told that they would be paid $125 for attending that session and eight other weekly sessions of 75-90 minutes each, in which they would engage in some simple exercises that were demonstrated at the first session. They were also informed that the timing of the payment would be $15 at the first session, $45 at the fifth session, and $65 at the ninth session. The first sessions were conducted in the second week of the 10-week quarter and the final sessions were conducted in the last week of classes.[7]

Given the length of time between control-group sessions and the modest payment, it is not surprising that there was considerable attrition for this group, even though we did send e-mail reminders prior to the last session. Forty-three people came to the first session of the control group, and 24 of these people also came to the last session; there is no obvious pattern that predicts *ex ante* those who would come to both sessions and those who would not. We also experienced some attrition in the intervention group, primarily after the first or second session. Fifty-one people came to the initial session and 36 of these people completed the training. Once again, there is no obvious pattern that predicts *ex ante* those who would complete the training and those who would not, though there were likely added stresses due to the fact that students may have reconsidered the

[7] It would have been nice to avoid the last session being so close to finals. However, we wished to have consecutive weeks (no breaks) for our study and needed to recruit participants in the first week of the 10-week quarter. In any event, it is not obvious that this factor would affect the treatment group and the control group differentially.

commitment relative to their academic priorities.[8] While we are aware of potential selection issues, we are comparing changes over time rather than levels, so that such selection issues should have less impact. At minimum, we are comparing changes for those people who voluntarily participated in our intervention to those people who were not afforded the opportunity to participate.[9]

Students in the control group were seated in a large classroom. Questionnaires were passed out and resting pulses were taken prior to the students filling out the questionnaire. After the questionnaires were completed, the resting pulses were taken once again.[10] With the wellness group, using the same classroom, we followed the same process in the first and last sessions, except that we added a selection of the mind-body practices after the questionnaires were completed, but before the resting pulses were taken for the second time Two 'wellness coaches' (not always the same from session to session) served as facilitators at each of the sessions throughout the duration of the wellness program period of the trial, implementing an integration of health and wellness coaching (life-skills development) plus mind-body practices (functional enhancement skills).[11]

Participants were provided with a 'Guide Book' (Health Action 2008) with information on both wellness and life coaching and mind-body practices, in order to enhance awareness throughout the term of the intervention. In the weekly sessions, the group typically first gathered as a whole and then broke into smaller groups (circles of 5-6 people). After the first assessment session, the meetings started with one of several mind-body practices (breath practice, self-massage, light meditation, and body movement), continued with the coaching and lifestyle planning and concluded with a relaxing mind-body practice using visualization or meditation. The breath practice used in the pre-post assessment

[8] The summary statistics and tests for differences between people who attended the last sessions of their respective treatments are shown in Appendix C. There are no obvious regular patterns. Of 62 comparisons, three are significant at the 5 percent level.

[9] We do not claim that people who are *ex ante* uninterested in such a program, but who are nevertheless induced to participate, will also benefit; however, we do feel that this is entirely possible.

[10] Due to logistical constraints in this (minimally-funded) experiment, we did not measure the participants' pulse rates individually. Instead, participants counted their pulse beats after the facilitator counted down to zero. While this could lead to measurement error or bias, we suspect that counting is not a difficult exercise for students and we see little reason to believe that deliberate errors were made. Even if students could somehow guess our research hypothesis, it would be difficult for them to correctly pick pulse rates so that they declined during a session and particularly across the first and last sessions (as they are unlikely to recall their pulse measurements from two months prior), which, as shall be seen, are the strongest results.

[11] While the techniques described in this section are quite specific, they are representative of the wide range of wellness techniques that available, all of which incorporate essential operational elements that trigger increased physiological and psychological self-regulatory capacity.

sessions was reviewed and utilized briefly at each session. It was suggested that participants use this breath practice on a regular basis to manage stress, enhance sleep and prepare for tests, etc. In later sessions, the participants were encouraged to request favorite mind-body practices.

At each meeting the participants reviewed the "Circle of Life" (12 domains of life):

- Diet/Nutrition
- Exercise
- Stress Mastery
- Relationship
- Financial Wellbeing
- Work/Career
- Play/Creativity
- Health Care
- Environment/Nature
- Life Purpose
- Self-Esteem/Emotions
- Spirituality

Throughout the term of the study participants refined their awareness and activities of these areas of lifestyle focus by choosing intentions and goals and receiving support, encouragement and accountability from their peers. They utilized a process called the "Blue Print for Success" as a planning and accountability support tool. Each person had 5-10 minutes for reviewing the week's progress and refining next 'action steps'. This interactive group support is the foundation of the "life-skills development" component of the Wellness Coaching process.

The questionnaires we used are presented in Appendix A. The first eight questions were concerned with the respondent's feelings vis-à-vis health care and disease prevention, while the next 21 questions addressed the respondent's experiences during the previous month or two. The final question (for the main treatment group only) involved an area of focus for the Circle of Life Coaching experience.

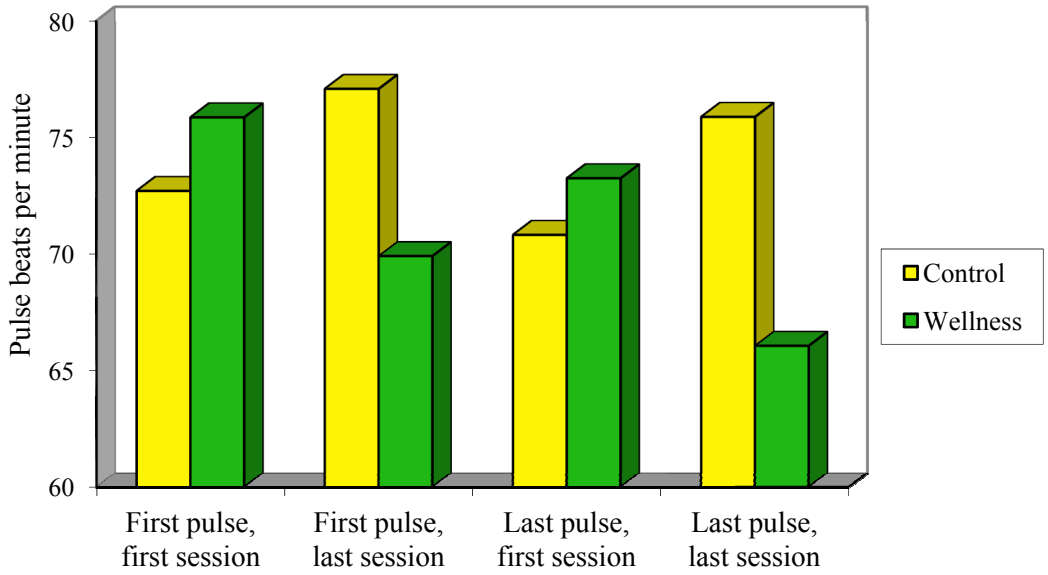
2. Results

Our most significant result is that resting pulse rates decreased significantly from the beginning of the program until the end for the wellness group as compared to the control. Figure 1 visually illustrates the average resting pulse rates for the

first and last sessions of the control and wellness group, while Table 1 provides more detail.

One comparison is between the change in the first rest pulse over the two-month period for the students in the wellness group and in the control group. By itself, the improvement in this rest-pulse rate is statistically significant; since the average resting pulse rate actually increased (although not significantly) over time for the control group, the comparison is even stronger.[12] It is especially notable that the difference in the changes in the rest-pulse rate was 10.31 beats per minute for the first pulse measurement and 12.21 beats per minute for the last pulse measurement; these differences are not minor.[13]

Figure 1: Average resting pulse rates



[12] It may seem surprising that the resting pulse rate increased for the control group over the course of the quarter. We suspect that the increase, although not significant, reflects the stress of the final exams scheduled for the week after the last session, and that this issue would also have increased the resting pulse rate for the treatment group if there had been no wellness intervention.

[13] There is little difference in the difference in the changes in the rest pulse rate across gender. For males, this is 10.04 for the first rest pulse and 10.62 for the last rest pulse, while these are respectively 9.99 and 12.61 for females.

Table 1: Average resting pulse rates and changes

Measure	Control Group (N=24)	Wellness Group (N=36)
First pulse, first session	72.71 (1.94)	75.86 (1.73)
First pulse, last session	77.08 (1.89)	69.92 (1.78)
Improvement	-4.37 (2.73)	5.94 (1.75)
Last pulse, first session	70.83 (2.10)	73.25 (1.84)
Last pulse, last session	75.88 (2.11)	66.08 (1.87)
Improvement	-5.04 (2.84)	7.17 (2.08)

Standard errors are in parentheses

Comparing the difference in the individual changes in the wellness group to those in the control group, the Wilcoxon ranksum test (see Siegel and Castellan 1988) gives $Z = 2.93$, $p = 0.002$, on the one-tailed test justified by our implicit hypothesis that the mind-body practice would lower the rest-pulse rate over time. A similar analysis of the last rest-pulse rate also shows a significant improvement over time in the main treatment, with the Wilcoxon ranksum test on individual changes across treatments gives $Z = 3.06$, $p = 0.001$, one-tailed test. Thus, we have strong statistical evidence of a biometric effect from the intervention protocol – wellness coaching for lifestyle planning and the implementation of mind-body practice.[14,15]

Regarding the impact of the mind-body practice on pulse rates over the course of a single session, when we compare the change in the wellness treatment to the change in the control treatment, we find no significant difference across treatments in the first session (the Wilcoxon ranksum test gives $Z = 0.66$, $p = 0.255$, one-tailed test), but there is a significant difference in the difference across treatments in the last session ($Z = 1.84$, $p = 0.033$, one-tailed test). As would be

[14] Other statistical tests confirm this significance. For example, the Kolmogorov-Smirnov test of cumulative distributions (see Siegel and Castellan 1988) finds significance at $p = 0.001$ for both comparisons.

[15] It is also possible that the observed changes in heart rate between the wellness and control group could have been driven by reductions in the workload among students in the wellness group. However, there is no reason to believe that this is the case; indeed, this could easily have gone in the other direction. In any event, we do not have access to administrative data, so we cannot tell if this is the case. Similarly, we cannot tell whether the wellness program led to improvements in academic performance (but see Charness and Gneezy, 2011, who find an improvement in grad-point average for people who had participated in a pay-for-exercise study two years previously.

predicted if the benefits of the intervention (coaching plus mind-body practice) deepen over time, the decrease over the course of the session is larger in the final session of the intervention group than in the first session of this same group. The sign test on individual differences (see Siegel and Castellan 1988) gives $Z = 1.73$, $p = 0.042$, one-tailed test).

We also run regressions on the changes across treatments in pulse rate within sessions and between the first and last sessions. These are reported in Table 2:

Table 2: OLS Regressions for changes in pulse rate across treatments

	First pulse, first – last session	Last pulse, first – last session	First - last pulse, first session	First - last pulse, final session
Wellness Treatment	10.319*** (3.091)	12.208*** (3.447)	0.736 (1.192)	2.625* (1.391)
Constant	-4.375* (2.394)	-5.042* (2.670)	1.875** (0.924)	1.208 (1.077)
N	60	60	60	60
R^2	.162	.178	.007	.058

Standard errors are in parentheses; *** indicates significance at $p = 0.01$, ** indicates significance at $p = 0.05$, and * indicates significance at $p = 0.10$ (all two-tailed tests).

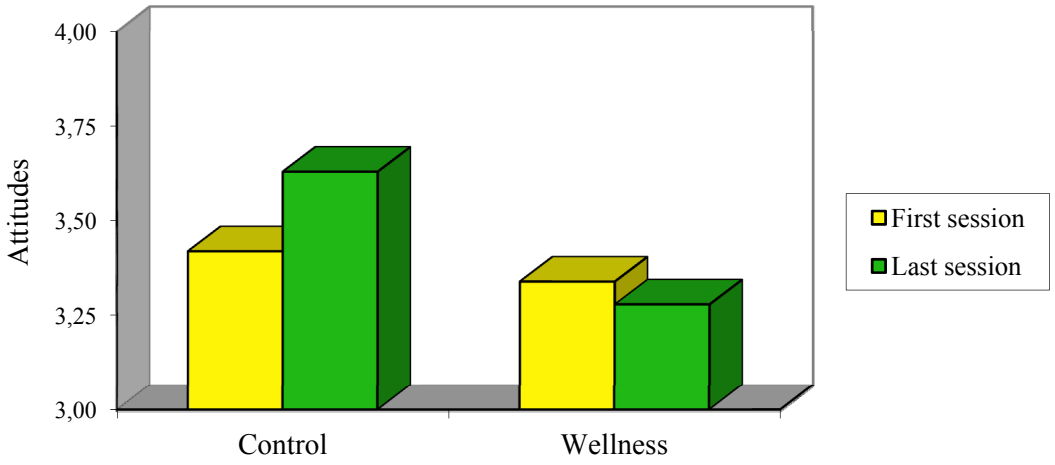
The regressions confirm the patterns found using the nonparametric tests. The wellness intervention has a significant beneficial effect on the difference over time for both the first pulse rat and the last pulse rate in the sessions. There is no difference across treatments in the change in the pulse rate over the course of the first session, with a significant effect (with a one-tailed test) across treatments in the change in the pulse rate over the course of the last session

Thus, we found that a wellness intervention including lifestyle planning and mind-body practice is useful for lowering the resting pulse rate significantly more than in the control group both over the course of the two-month period and over the course of the final session. These findings suggest that when an individual applies such practices, especially in a context where purposeful lifestyle planning and management is in place, it is likely that the individual will reduce his or her pulse rate – perhaps not just temporarily, but also sustainably. The implications of such skill development for health-risk reduction are compelling.

In addition, we compiled the questionnaire responses, shown in detail in Appendix B. Rather than make comparisons in the text for each individual question, we have created two indices. The first index, "attitudes", compiles the responses (ranging from 1-7) to questions 1-6. These responses reflect attitudes towards individual responsibility for health as opposed to reliance on the medical intervention, with higher numbers reflecting the latter case. The second index, "experiences" was created by summing the responses (ranging from 0 to 4) to questions 9-22 and 24-29; it reflects the experiences (such as depression, sleep difficulties, and feeling unable to cope) of the individual respondents in the previous month or two, with higher numbers reflecting poorer experiences.[16]

Figures 2 and 3 visually illustrate the average index values for attitudes and experiences, while Table 3 provides more detail and shows changes over time.

Figure 2: Average attitude (1-7 scale), by treatment



[16] We reversed the numbers attached to the responses to questions 12, 13, 16, 20, 26, and 27, so that lower numbers are more favorable for all questions in the index.

Figure 3: Experiences (0-4 scale) by treatment

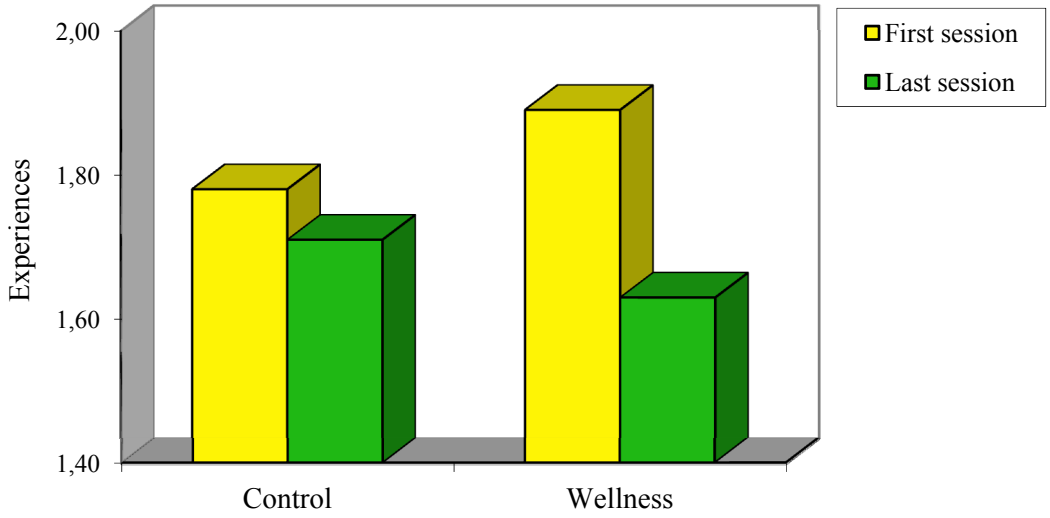


Table 3: Average questionnaire index values

Index, group	First session	Last session	Difference
Attitudes (1-7), control group	3.42 (0.14)	3.63 (0.17)	0.21 (0.14)
Attitudes (1-7), wellness group	3.34 (0.14)	3.28 (0.16)	-0.06 (0.12)
Experiences (0-4), control group	1.78 (0.09)	1.71 (0.08)	-0.07 (0.07)
Experiences (0-4), wellness group	1.89 (0.08)	1.63 (0.07)	-0.25 (0.06)

Standard errors are in parentheses

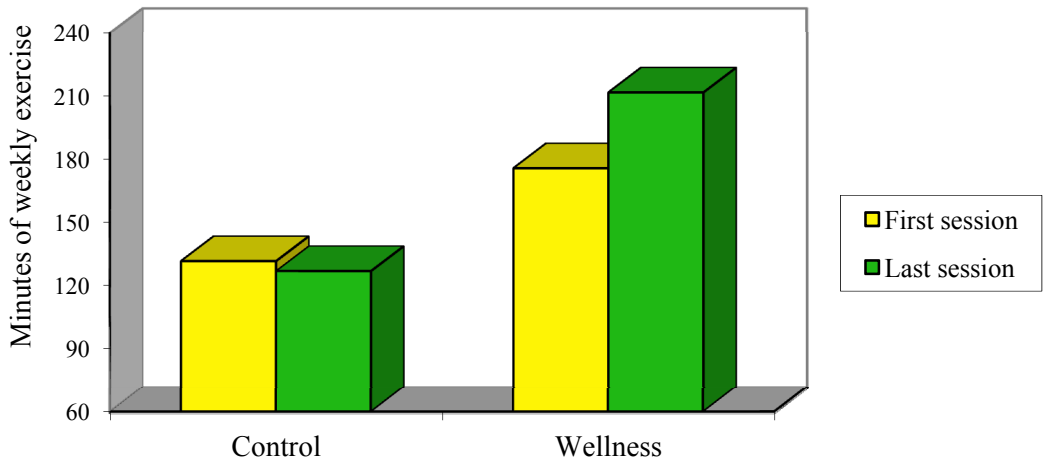
We see only a minor decrease in the attitudes index for the wellness group, however, the more appropriate test is to compare the change to that of the control group. A Wilcoxon ranksum test across treatments on individual changes in the attitudes index indicates only a marginally-significant difference ($Z = 1.39$, $p = 0.083$, one-tailed test). The same test across treatments on individual changes in

the experiences index indicates a more significant difference ($Z = 2.14$, $p = 0.016$, one-tailed test).[17] Overall, there were improvements in 17 of the 20 components in the experiences index for the wellness group, with major improvements in the number of times the respondent felt nervous or stressed, how often sleep was problematic, and the anxiety level. In addition, while we don't ask question 30 (satisfaction in the most urgent area of one's life) of the control group, there is a dramatic and significant improvement for the wellness group, from 3.96 to 6.53 on a 1-10 scale. In fact, there was improvement for 28 people and deterioration for only two people; this pattern is significant at $p = 0.000$.

It appears that there are indeed benefits for the students in the wellness group exploring lifestyle skills enhancement and mind-body practice, as measured by their experiences. It also appears that changes in attitudes may come more slowly than changes in experience.

We considered the question about exercise separately, as it doesn't scale with the other questions on experiences. We computed the number of minutes of reported weekly exercise by multiplying the number of times one exercised per week by the average length of time reported for each exercise session. Figure 4 shows the average weekly exercise minutes for both groups, while Table 4 provides more detail.

Figure 4: Average reported weekly minutes of exercise



[17] Note that the experiences index improved over time for 25 people in the wellness group, while deteriorating for seven people in this group. By comparison, the experiences index improved over time for 11 people in the control group, while deteriorating for 12 people in this group.

Table 4: Exercise by Treatment

Measure	Control Group	Wellness Group
Exercise, first session	131.7 (21.8)	175.7 (28.7)
Exercise, last session	127.0 (27.1)	211.6 (30.9)
Improvement	-4.7 (21.6)	35.9 (24.0)

The amounts of exercise are in minutes. Standard errors are in parentheses

The average time spent exercising per week decreased by 4.7 minutes for the control group over time. Given the proximity of final exams to the end of the sessions, it seems reasonable that this would be the case. On the other hand, we found a substantial increase of 35.9 minutes of weekly exercise for the participants in the wellness group in the time spent on exercise. The difference in the change in exercise time is only marginally significant according to the Wilcoxon ranksum test on individual differences ($Z = 1.55$, $p = 0.060$, one-tailed test). However, two other tests show solid statistical significance. First, the median test (see Siegel and Castellan 1988) for the change in exercise time over the two groups gives $\chi^2 = 4.83$, $p = 0.028$. Second, since only 25% of the control group increased their exercise time, while 55% of the treatment group did so, the test of proportions (Glasnapp and Poggio 1985) finds a significant difference ($Z = 2.23$, $p = 0.013$, one-tailed test) between these two populations.

It is important to note that the coaching process does not tell participants what to do and there is no direct suggestion that exercise is something that one "should" do. Clearly we are speculating, yet it is entirely plausible that the wellness group determined (through the wellness coaching process) that increased exercise assists in stress management and even in focusing for academic study.

3. Discussion

As we have found a marked decrease in resting-pulse rates for the wellness group relative to the change for the control group, this suggests that lifestyle planning and mind-body practice (combined and perhaps as separate interventions as well) are significantly promising for increasing the well-being and overall health. These relatively-low-cost, group-based interventions have the potential for being disseminated across a wide variety of populations. These results are particularly strong given that undergraduate university students almost certainly have fewer health problems than the general populace. Since the amount spent annually on

health care is so great, it follows that even tiny improvements will yield very large benefits.

We found that a group of relatively healthy undergraduate students was able to significantly shift their health status with a minimal wellness intervention. Through a wellness-coaching and mind-body practice regimen they learned to control their pulse rate, had significantly improved 'experience' of physical and emotional wellbeing and, with no specific encouragement to do so, spontaneously increased their volume of weekly exercise. Our intent was to investigate the potential of a relatively low-cost, group-based wellness intervention for improving health status and providing economic benefits. As the health aspect appears to have borne fruit, there is the real possibility that such interventions can have a substantial positive economic impact.

We would like to mention some concerns with our study. One may feel that students have stronger social networks, so that the peer effects that may help to drive our results might not be present in another environment. However, very few (if any) of our participants were friends with any of the others, as there are about 20,000 students at UCSB. We believe that social networks and peer effects would be stronger in a workplace environment, which seems the easiest place to roll out such programs. A second issue is that students might not have been familiar with the location of the room, so that the students in the control treatment might have arrived in a more stressed condition, since they did not attend every week. However, the building in which the sessions were conducted is one of the most well-known on campus, so this seems unlikely.

4.1 Pulse Reduction & Heart Failure: Estimated Savings

It is our intent with this pilot to begin to develop some preliminary formulation of the economic benefits of wellness programming for larger populations, that we will further refine in future research. In order to assess the influence of health-improving behaviors on the economics of our society we present here some of our early calculations and projections for medical savings based on our results. The main hurdle for developing these estimates using the data from the experimental intervention is that the direct link between resting pulse and heart failure is not perfectly established in the medical field. A recent medical review article on the direct effects of pulse on long-term heart function presents an extensive list of potential pathways, but they all lack verification in human patients (Custodis et al. 2010). The principal effects of elevated pulse are in the promotion of atherosclerosis; the thickening of artery walls in the heart. In vitro studies have demonstrated that elevated levels of shearing stress caused by high resting pulse rates promote arterial growth (Blackman, Garcia-Cardena and Gimbrone 2002).

Mechanically lowering the heart rate of mice improved endothelial (inner lining of blood vessels) functionality independent of blood pressure and fat levels (Custodis, Baumhäkel, Schlimmer et al. 2008). These particular studies suggest that a 13-17% heart rate reduction helps to protect this lining.[18]

However promising the evidence appears to be, without good human-subject data, it is difficult to turn the above facts into compelling estimates. The only solid figure here is the 13-17% reduction in heart rate; in our treatment group, the mean reduction was 8%. Since the implications of such reductions are tested only in mice and apply to atherosclerosis, rather than directly to heart failure, we instead focus on one specific aspect of heart rate reduction that we feel can be roughly modeled: heart fatigue. Thubrikar and Robicsek (1995) introduced the concept of heart failure as a result of cumulative fatigue. The idea that a heart that beats faster fatigues more quickly is the basic motivating premise. Our estimation methodology involves a number of assumptions that may not be entirely realistic, but in some sense we have attempted to err on the conservative side to avoid inappropriate claims while emphasizing future potential – in wellness economics. For example, we do not consider any of a multitude of other aspects of improvement in mental and physical health. Our focus is simply to explore the cost savings potential for a population of those at risk for heart failure.[19]

A common benchmark for the age of a heart is the average pulse in the U.S., approximately 72 beats per minute. A heart that beats at 72 times per minute for a year is one heart year older. Data for 2004, from the Center for Disease Control and Prevention (2007), provides risks of heart failure for four different age ranges (0-44, 45-64, 64-84, and 85+). Using the data from the wellness group, we can model the aging of hearts in heart years (and the aging of participants in actual years). In this context we assume that the change in the heart rate observed at the end of the program remains constant throughout the remaining lifespan.[20] Using this information, we can estimate how long each person stays within each risk group, and then determine the likelihood that they will have at least one episode of heart failure during their life (expectancy 77.9 years, using 2004 data). Using the data from our findings, this gives a decrease of

[18] Monkeys with naturally lower heart rates have been shown to exhibit fewer atherosclerotic lesions (Kaplan, Manuck and Clarkson 1987). There is evidence from follow-ups of angiographies (x-ray mappings of coronary arteries to search for plaque) that in a multivariate framework, higher heart rates were predictive of plaque formation (Heidland and Strauer 2001).

[19] According to the CDC: "Heart failure is a condition where the heart cannot pump enough blood and oxygen to meet the needs of other body organs. Heart failure does not mean that the heart has stopped beating, but that it actually fails and cells begin to die for lack of oxygen. See http://www.cdc.gov/dhdsp/library/fs_heart_failure.htm.

[20] While this assumption is unsubstantiated, it does not seem completely unrealistic; in fact, it is possible that continued self-practice will widen this gap as people age.

seven percentage points (from the constant of 0.32 in the regression) for this likelihood.

Estimates in 2009 for the costs of heart failure in the United States from the American Heart Association can be broken down into direct and indirect costs (Lloyd-Jones et al. 2009). Direct costs include hospital visits ($20.1 billion), nursing home care ($4.5 billion), physician care ($2.4 billion), purchase of medical durables ($3.3 billion) and home health care ($3.4 billion, includes drugs) for a total of $33.7 billion. Indirect costs represent the lost future earnings of those who died from heart failure, and add another $3.5 billion to the bill, yielding a grand total of $37.2 billion.

To calculate savings, recall that our data indicated a 32% probability of having at least one heart failure incident in a lifetime (Lloyd-Jones et al. 2002 puts the lifetime risk rate at about 20%; the discrepancy is partly explained by the fact that the American Heart Association only calculates these cumulative risks beginning at age 40), which the treatment reduced to 25%. The chances of never having heart failure, 68% and 75%, respectively, are the intersections between the probabilities of not having an episode in any given year. This gives us yearly probabilities of 99.36% and 99.52% for not having an incident, and thus 0.64% and 0.48% probabilities of having an incident. The treatment effect on the yearly level is thus a decrease in probability of 0.16%, which is a 25.43% reduction. The resulting savings estimate is thus $9.5 billion/year.[21]

A confound to this estimate is that medical expenditures on other diseases may substitute for medical expenditures on heart failure. Perhaps the diseases that cause death instead of heart failure are even more costly to treat. This warrants the use of some another metric to evaluate our intervention. Ashenfelter and Greenstone (2004) use changes in speed limits to estimate self-evidenced values of statistical life. They advertise $1.54 million (1997 dollars, 2.06 million in 2009 dollars) as their best estimate. So rather than estimate the medical savings, we can estimate the life-savings of the intervention. Twenty-year-olds (benchmark subject age) should be willing to pay $144,200 for a 7% cumulative risk reduction for their entire lives. So in terms of an individual cost-benefit analysis, the intervention passes the test.

Our intention with this creative analysis is to interface the data of a controlled study with assumptions that leverage a glimpse of what is possible in wellness-based economics. It is apparent that these estimates for medical savings have great promise though we have explored only one category of health

[21] We hasten to add that a reduction from heart failure would lead to an extended life span and a likely increase in other medical costs; in addition, such interventions would have a modest cost. Nevertheless, a more fit population would be expected to have reduced medical costs overall.

expenditures – heart disease.[22] In any case, it should be clear that the potential health and economic benefits from such interventions are quite large.

To close this discussion, we note that it is widely known that stress increases the risk for heart disease and that dietary factors as well have the influence of increasing the risk for heart failure. In both wellness coaching and mind-body practice the areas of nutrition, exercise, and attention to neutralizing the negative effects of stress are key considerations. In the mind-body stress mastery aspect of the wellness intervention, practices that influence the autonomic nervous system have the potential to reduce the heart rate with a coincident effect of lowering blood pressure and expanding blood vessels, including the capillaries that deliver oxygen to the heart, brain, organs, and glands. These include breathing practices, gentle movements (as in Tai Chi, Qigong and Yoga), self-massage, meditation, visualization, and relaxation. Though still limited in this case just to heart disease, this is another factor that could reduce risk and therefore reduce the health care dollars unnecessarily spent on treating preventable diseases.

4.2 Net benefits and implementation

Natural questions for economists include the external validity of our study and whether an intervention such as this would be cost-effective.[23] Another question is how one might implement a wellness program in a workplace.

More conventional wellness programs, which typically focus only on diet and exercise, have been in existence for some years now. Some larger firms have been experimenting with these programs for over 15 years – Berry, Mirabito, and Baun (2010) report that the percentage of smokers among Johnson and Johnson employees has dropped by more than two-thirds since 1995, and that executives estimate that wellness programs have saved the firm $250 million on health-care costs over the past decade, with a return on investment of $2.71 for every dollar spent for the period 2002-2008. Recently, a fledgling consulting industry has taken root, devising plans for firms to financially incentivize workers for improvements in diet and exercise. Three such firms are Tangerine Wellness, RedBrick Health, and Virgin HealthMiles. The first of these firms instituted a program for the staff at a large retirement community in Illinois, this program

[22] For example, other benefits could include savings in resources such as physicians' time and the work time of patients.

[23] A narrow measurement of cost effectiveness is the effect of a wellness program on a firm's profitability. More broadly, there are likely further benefits to society from having a healthier and less stressed population. We focus only on the more narrow measurement, but point out that the true benefits are even higher.

costs between $20,000 and $30,000 per year. At the same time, health-insurance claims dropped by 19 percent and turnover dropped by 30 percent (Wall Street Journal Online 2008).

Milani and Lavie (2009) report the results of cardiac rehabilitation and exercise training with an undisclosed firm and 339 participants. In addition to improvements in scores for depression and anxiety, they estimate (p. 1391) that "for every dollar invested in worksite intervention, $6 was realized in health care savings." Berry, Mirabito, and Baun (2010) report that a wellness program at MD Anderson Cancer Center reduced lost work days by 80 percent over six years, and workers' comp insurance premiums declined by 50 percent; similarly, the rate of voluntary turnover for the Biltmore hotels dropped from 19 percent to 9 percent from 2005 to 2009.

So there appears to be considerable, if somewhat embryonic, evidence that conventional wellness programs have substantial net economic benefit for firms that implement these. Of course we are considering a less standard wellness program, and the relative effectiveness (vis-à-vis standard programs) of this approach is an open question. We feel that, in principle, a mind-body approach should be considerably more effective, since it targets underlying issues and motivations rather than purely physical activities and financial benefits *per se*. Nevertheless, the data are meager to date. Aetna recently conducted a randomized control pilot of 12-week stress-reduction programs that used programs involving mindfulness meditation or therapeutic yoga (Fierce Healthcare, 2011). Both approaches were deemed to be successful, and the results indicate a positive correlation between stress levels and health care costs; the annual medical costs for those reporting the highest levels of stress were $2,000 more than for those reporting the lowest levels of stress. In our view, a comprehensive wellness program that combines diet and exercise elements along with mind-body practices would be particularly effective, but this has yet to be properly tested.

There are many practical details concerning how to implement wellness programs, and these details also generally apply to mind-body approaches.[24] Important factors include planning and patience, having senior management show an interest in participating, permitting individualization, keeping the communication channels open, making the programs accessible, and 'keeping it fun'. Some commentators advocate competitions, while others emphasize having support groups and 'wellness buddies'.[25] In any case, there are many practical

[24] Readers interested in implementation of wellness programs may wish to read Goetzel and Ozminkowski (2008) or to 'attend' the webinar at http://healthpromotionlive.com/2011/08/02/ron-goetzel-of-emory-universitythomson-reuters/.

[25] In fact, Babcock, Bedard, Charness, Hartman, and Royer (2010) find significant peer effects in a carefully-controlled pay-for-exercise experiment.

details that must be arranged. At larger firms, economies of scale make it seem advisable to conduct mind-body wellness programs on a continual basis, much as is currently done with more standard wellness programs. This approach sidesteps the issue of the 'half-life' of the effectiveness of transient programs, about which there are very little data; our suspicion is that it is best to have 'refresher' sessions for people. In practice, smaller organizations may wish to conduct such programs on a scheduled but non-continual basis.

While it is difficult to accurately predict the exact cost of implementation, standard wellness programs have been shown to be quite cost-effective and we believe that a group-based mind-body approach, involving little more additional expense than the cost of trainers, should be even more so. Training programs need not be held all day, but can instead be held during a specified period of time. We estimate that the cost of providing professional trainers for a mind-body program involving perhaps three hours per week (separate weekly sessions for each of two groups) might cost $20,000 - $25,000 annually ($75/hour for each of two trainers would come to $23,400 for 52 weeks).

4. Conclusion

Given the magnitude of the costs of health care and the fact that many expensive diseases are preventable, it appears to be worthwhile to explore a wide array of wellness options to complement conventional medical care and to begin to develop a paradigm for the economics of wellness – wellness economics. It is apparent that some portion, likely a significant one, of medical expenses for treating preventable diseases could be eliminated. In the spirit of the emerging trend of positive returns on investment in corporate weight-loss programs and recent field interventions to promote exercise, we have introduced a group of undergraduate students to wellness coaching and mind-body exercises such as breath practices, self-massage, meditation, and body movements. Given the increased interest of the most respected medical schools in alternative clinical approaches (Consortium of Academic Health Centers for Integrative Medicine 2009) and the interest in developing non-cognitive skills, our intent was to demonstrate an improvement in the experience of well-being for our participants.

As a part of this project we began the development of a general set of assumptions that propose that health literacy and wellness-inducing activities not only have a positive influence on health status, but also that they exert a positive influence on economic health. In short, increases in wellness, health, and productivity, as well as the reallocation of funds typically spent on medical treatment for preventable illnesses into pro-active wellness-promotion activities and lifestyles, will have a significant beneficial influence on the economy. Stated

more thoroughly, wellness activities could lead to increased health literacy, which in turn could lead to improved lifestyle attitudes and choices, better physical and mental health, and more self-reliant behavior.

We were gratified to find (relative to the control group) not only a significant improvement in the wellness experiences index, but also a significant decrease in the rest-pulse rate and a major increase in exercise in 8 weeks. As in Charness and Gneezy (2009), success was achieved without financial performance incentives, in some sense making the results more striking. Given that we found this effect on a presumably very healthy segment of the population, there appears to be considerable promise for such interventions with other, less healthy, groups. Positive results for this population would more clearly predict the long-term positive economic benefits; these include increased productivity and the reallocation of funds spent on the treatment of preventable diseases to more useful purposes.

Our study has a number of limitations. The number of participants in this study is small. We do not have measurements of economic outcomes. It is not entirely clear how much compensation would be necessary to induce older adults to participate in such programs, or whether those people who might receive the most benefit would actually participate. Finally, there are many moving parts in our intervention, and the degree to which each part of the intervention drives the observed changes in unclear. Further work with a larger sample is needed to disentangle these factors, varying each of the components of the intervention systematically. Nevertheless, we view our study as a first step in examining the potential for important improvements in biometric and economic outcomes from wellness activities, with substantial benefits for society.

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Appendix A - Questionnaires

Questionnaire in the first session (question 30 appeared only in the main treatment)

1. Who do you feel is most responsible for your health care, you or your doctor?

1	2	3	4	5	6	7
Myself						My doctor

2. In terms of public policy, would you say that health care is more about medical intervention or more about caring for health?

1	2	3	4	5	6	7
Caring for health						Medical intervention

3. In terms of individual rights and responsibilities, would you say that health care is more about medical intervention or more about caring for health?

1	2	3	4	5	6	7
Caring for health						Medical intervention

4. In the case of a broken bone, would you say the more important resource for healing is with medical treatment or within the human body?

1	2	3	4	5	6	7
Within body						Medical treatment

5. In the case of recurring stress headaches, would you say the more important resource for healing is with medical treatment or within the human body?

1	2	3	4	5	6	7
Within body						Medical treatment

6. In the case of frequent insomnia, would you say the more important resource for healing is with medical treatment or within the human body?

1	2	3	4	5	6	7
Within body						Medical treatment

7. If you were to be introduced to practices that you could use on your own to improve your feelings of well-being, how enthusiastic would you be about adopting them?

1	2	3	4	5	6	7
Not at all						Very enthusiastic

8. If you feel stressed or depressed, which of these are you likely to do (check all that apply)?

a. Exercise	_____
b. Meditate	_____
c. Journal	_____
d. Talk to a close friend or family member	_____
e. Talk to an advisor/counselor	_____
f. See a physician	_____
g. Take prescription medication	_____
h. Consume alcohol or recreational drugs	_____
i. Consume "junk" food or eat mindlessly	_____
j. Watch TV	_____
k. Listen to loud music - like rock	_____
l. Listen to mellow, peaceful, relaxing music	_____
m. Read spiritual writings	_____
n. Read self help books	_____

9. In the last month, how often have you been upset because of something that happened unexpectedly?

Never	0
Almost Never	1
Sometimes	2
Fairly Often	3
Very Often	4

10. In the last month, how often have you felt that you were unable to control important things in your life?

Never	0
Almost Never	1
Sometimes	2
Fairly Often	3
Very Often	4

11. In the last month, how often have you felt nervous and "stressed"?

Never	0
Almost Never	1
Sometimes	2
Fairly Often	3
Very Often	4

12. In the last month, how often have you felt confident about your ability to handle your personal problems?

Never	0
Almost Never	1
Sometimes	2
Fairly Often	3
Very Often	4

13. In the last month, how often have you felt that things were going your way?

Never	0
Almost Never	1
Sometimes	2
Fairly Often	3
Very Often	4

14. In the last month, how often have you found that you could not cope with all things you had to do?

Never	0
Almost Never	1
Sometimes	2
Fairly Often	3
Very Often	4

15. In the last month, how often have you been able to control irritations in your life?

Never	0
Almost Never	1
Sometimes	2
Fairly Often	3
Very Often	4

16. In the last month, how often have you felt that you were on top of things?

Never	0
Almost Never	1
Sometimes	2
Fairly Often	3
Very Often	4

17. In the last month, how often have you been angered because of things that happened that were out of your control?

Never	0
Almost Never	1
Sometimes	2
Fairly Often	3
Very Often	4

18. In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?

Never	0
Almost Never	1
Sometimes	2
Fairly Often	3
Very Often	4

19. In the last month, how often have you felt that you have not had enough energy?

Never	0
Almost Never	1
Sometimes	2
Fairly Often	3
Very Often	4

20. In the last month, how often have you given yourself some quiet time?

Never	0
Almost Never	1
Sometimes	2
Fairly Often	3
Very Often	4

21. In the last month, how often have you felt depressed?

Never	0
Almost Never	1
Sometimes	2
Fairly Often	3
Very Often	4

22. In the last month, how often has your sleep been less than satisfactory or problematic?

Never	0
Almost Never	1
Sometimes	2
Fairly Often	3
Very Often	4

23. In the past **two** months, how many times per week have you engaged in regular physical exercise?

Zero	0
One	1
Two	2
Three	3
Four or more	4

How much time per session, on average? _____

24. In the past **two** months, how many times have you seen a doctor?

Zero	0
One	1
Two	2
Three	3
Four or more	4

25. In the past **two** months, how often have you used counseling services?

Never	0
Almost Never	1
Sometimes	2
Fairly Often	3
Very Often	4

26. In the past **two** months, how often have you bought or used "self-help" products such as DVDs, CDs, books, etc.?

Never	0
Almost Never	1
Sometimes	2
Fairly Often	3
Very Often	4

27. In the past **two** months, how often have you bought or used "self-help" products such as teas, essential oils, herbal formulas, etc.?

Never	0
Almost Never	1
Sometimes	2
Fairly Often	3
Very Often	4

28. In the past **two** months, regarding studies, work, and activities, which of the following is most accurate for you?

No difficulties	0
Thoughts and feelings of incapacity	1
Loss of interest in activity	2
Decrease in actual activity	3
Stopped working because of illness	4

29. In the past **two** months, regarding your anxiety level, which of the following is most accurate for you?

No difficulties	0
Subjective tension and irritability	1
Worry about minor matters	2
Felt anxious often	3
Felt anxious most of the time	4

30. Please choose the area of your life that you are most interested and motivated to focus on improving at this time (select one):

a. Nutrition	___	g. Health Care	___
b. Exercise	___	h. Environment	___
c. Stress Mastery	___	i. Life Purpose	___
d. Relationships	___	j. Self Esteem	___
e. Work	___	k. Spirituality	___
f. Play/Creativity	___		

Now consider how satisfied you are in this area and score it by circling a number on the scale.

0	1	2	3	4	5	6	7	8	9	10
As dissatisfied as I could be										As satisfied as I could be

Questionnaire in the final session

All of the questions were the same, except that question 30 in the main treatment became:

Please choose the area of your life that you have been the most focused on improving during the term of this Circle of Life Coaching experience over the last two months (select one):

a. Nutrition ___
b. Exercise ___
c. Stress Mastery ___
d. Relationships ___
e. Work ___
f. Play/Creativity ___
g. Health Care ___
h. Environment ___
i. Life Purpose ___
j. Self Esteem ___
k. Spirituality ___

Now consider how satisfied you are in this area and score it by circling a number on the scale.

0	1	2	3	4	5	6	7	8	9	10
As dissatisfied as I could be										As satisfied as I could be

Appendix B – Questionnaire responses over time

Summary Statistics for Questionnaire Responses – Wellness Group

Question	First session	Last session
1. Responsible for health (doctor = 7)	2.14 (0.17)	2.39 (0.21)
2. Public policy	3.86 (0.30)	4.28 (0.32)
3. Individual rights and responsibilities	2.58 (0.20)	2.86 (0.26)
4. Broken bone	4.78 (0.30)	4.69 (0.31)
5. Recurring stress headaches	3.06 (0.27)	2.67 (0.25)
6. Frequent insomnia	3.64 (0.26)	2.78 (0.25)
7. Enthusiasm about new practices (very = 7)	5.92 (0.18)	5.44 (0.22)
9. Number of times upset in last month	2.00 (0.16)	1.61 (0.15)
10. Number of times unable to control things	1.97 (0.18)	1.50 (0.14)
11. Number of times nervous and "stressed"	2.69 (0.14)	2.11 (0.16)
12. How often confident in last month (never = 0)	2.81 (0.15)	2.86 (0.13)
13. How often things going your way	2.22 (0.13)	2.72 (0.15)
14. How often could not cope	1.83 (0.19)	1.50 (0.16)
15. How often not able to control irritations	2.64 (0.14)	2.72 (0.14)
16. How often felt on top of things	2.44 (0.17)	2.56 (0.16)
17. How often angered by things out of your control	1.92 (0.19)	1.53 (0.17)
18. How often difficulties piling too high	1.64 (0.18)	1.28 (0.17)
19. How often not enough energy	1.86 (0.20)	1.89 (0.15)
20. How often given yourself quiet time	2.42 (0.19)	2.89 (0.15)
21. How often depressed	1.56 (0.17)	1.36 (0.13)
22. How often sleep problematic	2.19 (0.21)	1.83 (0.19)
23. Minutes of exercise per week (past 2 months)	175.7 (28.7)	211.6 (30.9)
24. How many times seen doctor	0.64 (0.17)	0.75 (0.19)
25. How many times used counseling services	0.39 (0.16)	0.33 (0.15)
26. How often bought self-help books, etc. (2 months)	0.17 (0.10)	0.36 (0.13)
27. How often bought self-help teas, etc. (2 months)	0.56 (0.17)	0.67 (0.16)
28. How often work difficulties (no difficulties = 0)	1.14 (0.13)	1.00 (0.16)
29. Anxiety level (no difficulties = 0)	1.89 (0.19)	1.33 (0.18)
How satisfied in area of life	3.96 (0.28)	6.53 (0.29)

Standard errors are in parentheses. N = 36

Summary Statistics for Questionnaire Responses – Control Group

Question	First session	Last session
1. Responsible for health (doctor = 7)	1.96 (0.21)	2.12 (0.25)
2. Public policy	3.88 (0.38)	3.71 (0.34)
3. Individual rights and responsibilities	2.46 (0.24)	3.38 (0.36)
4. Broken bone	4.96 (0.37)	5.04 (0.37)
5. Recurring stress headaches	3.46 (0.40)	3.67 (0.38)
6. Frequent insomnia	3.79 (0.43)	3.83 (0.37)
7. Enthusiasm about new practices (very = 7)	5.63 (0.25)	5.75 (0.23)
9. Number of times upset in last month	1.92 (0.17)	1.62 (0.16)
10. Number of times unable to control things	2.08 (0.22)	1.71 (0.19)
11. Number of times nervous and "stressed"	2.46 (0.17)	2.33 (0.17)
12. How often confident in last month (never = 0)	2.83 (0.16)	2.96 (0.18)
13. How often things going your way	2.29 (0.18)	2.75 (0.19)
14. How often could not cope	1.62 (0.23)	1.62 (0.21)
15. How often not able to control irritations	2.67 (0.17)	2.88 (0.16)
16. How often felt on top of things	2.33 (0.18)	2.58 (0.21)
17. How often angered by things out of your control	1.79 (0.21)	1.50 (0.18)
18. How often difficulties piling too high	1.33 (0.20)	1.21 (0.13)
19. How often not enough energy	1.96 (0.19)	2.17 (0.19)
20. How often given yourself quiet time	2.50 (0.17)	2.41 (0.16)
21. How often depressed	1.58 (0.22)	1.25 (0.21)
22. How often sleep problematic	1.54 (0.18)	1.88 (0.23)
23. Minutes of exercise per week (past 2 months)	131.7 (21.8)	127.0 (27.1)
24. How many times seen doctor	0.50 (0.19)	0.54 (0.16)
25. How many times used counseling services	0.08 (0.06)	0.21 (0.10)
26. How often bought self-help books, etc. (2 months)	0.17 (0.10)	0.12 (0.09)
27. How often bought self-help teas, etc. (2 months)	0.33 (0.14)	0.38 (0.13)
28. How often work difficulties (no difficulties = 0)	0.92 (0.19)	0.83 (0.21)
29. Anxiety level (no difficulties = 0)	1.67 (0.23)	1.62 (0.24)

Standard errors are in parentheses. N = 24

Appendix C: Questionnaire results by completion

Summary Statistics for Questionnaire Responses – Wellness Group

Question	Finished	Didn't	Z-statistic
First pulse	75.86(10.37)	70.14 (7.54)	-1.77
Later pulse	73.25(11.01)	71.43 (9.10)	-0.47
1. Responsible for health (doctor = 7)	2.14 (1.01)	1.93 (1.00)	-0.68
2. Public policy	3.86 (1.79)	4.07 (1.73)	0.26
3. Individual rights and responsibilities	2.58 (1.20)	2.64 (1.50)	-0.04
4. Broken bone	4.78 (1.81)	4.29 (1.77)	-0.89
5. Recurring stress headaches	3.06 (1.64)	3.50 (1.91)	0.68
6. Frequent insomnia	3.64 (1.55)	2.57 (1.40)	-2.18
7. Enthusiasm about new practices (very = 7)	5.92 (1.08)	6.00 (0.96)	0.11
9. Number of times upset in last month	2.00 (0.99)	2.07 (0.27)	0.28
10. Number of times unable to control things	1.97 (1.08)	2.36 (1.22)	1.20
11. Number of times nervous and "stressed"	2.69 (0.86)	2.79 (1.12)	0.16
12. How often confident in last month (never = 0)	2.81 (0.92)	2.71 (0.99)	-0.37
13. How often things going your way	2.22 (0.76)	2.14 (0.77)	-0.34
14. How often could not cope	1.83 (1.16)	2.00 (1.24)	0.34
15. How often not able to control irritations	2.64 (0.87)	2.21 (1.05)	-1.47
16. How often felt on top of things	2.44 (1.00)	2.07 (0.83)	-1.26
17. How often angered by things out of your control	1.92 (1.13)	2.00 (0.96)	0.26
18. How often difficulties piling too high	1.64 (1.10)	1.93 (1.07)	0.83
19. How often not enough energy	1.86 (1.17)	2.21 (0.86)	0.86
20. How often given yourself quiet time	2.42 (1.13)	2.29 (0.99)	-0.49
21. How often depressed	1.56 (1.00)	1.86 (0.37)	0.37
22. How often sleep problematic	2.19 (1.24)	2.07 (1.44)	-0.44
23. Minutes of exercise per week (past 2 months)	175.7 (169.8)	131.8 (106.9)	-0.58
24. How many times seen doctor	0.64 (1.01)	0.50 (1.09)	-0.69
25. How many times used counseling services	0.39 (0.93)	0.79 (1.48)	0.82
26. How often bought self-help books, etc. (2 months)	0.17 (0.61)	0.86 (1.41)	2.39
27. How often bought self-help teas, etc. (2 months)	0.56 (1.00)	0.36 (0.93)	-0.88
28. How often work difficulties (no difficulties = 0)	1.14 (0.80)	1.64 (1.08)	1.56
29. Anxiety level (no difficulties = 0)	1.89 (1.14)	2.14 (1.35)	0.76
How satisfied in area of life	3.96 (1.68)	3.57 (1.87)	-0.20
34. Access a coaching program (yes = 1, no = 2)	-	-	-
40. Program leads to less medical care	-	-	-

Standard deviations are in parentheses. N = 36. Z-statistic is from the Wilcoxon ranksum test.

Summary Statistics for Questionnaire Responses – Control Group

Question	Finished	Didn't	Z-statistic
First pulse	72.71 (9.51)	75.68 (12.60)	0.48
Later pulse	70.83 (10.28)	71.47 (13.65)	-0.43
1. Responsible for health (doctor = 7)	1.96 (1.04)	2.11 (1.00)	0.48
2. Public policy	3.88 (1.87)	4.16 (2.01)	0.50
3. Individual rights and responsibilities	2.46 (1.18)	3.17 (1.42)	1.60
4. Broken bone	4.96 (1.81)	4.68 (1.67)	-0.62
5. Recurring stress headaches	3.46 (1.98)	2.68 (1.49)	-1.27
6. Frequent insomnia	3.79 (2.08)	3.00 (1.29)	-1.08
7. Enthusiasm about new practices (very = 7)	5.63 (1.21)	5.79 (0.96)	0.67
9. Number of times upset in last month	1.92 (0.83)	1.95 (0.97)	-0.26
10. Number of times unable to control things	2.08 (1.06)	1.84 (1.07)	-0.83
11. Number of times nervous and "stressed"	2.46 (0.83)	2.26 (1.12)	-0.62
12. How often confident in last month (never = 0)	2.83 (0.76)	2.92 (0.89)	0.49
13. How often things going your way	2.29 (0.86)	2.47 (0.51)	0.90
14. How often could not cope	1.62 (1.13)	1.79 (1.24)	0.52
15. How often not able to control irritations	2.67 (0.82)	2.47 (1.05)	-0.43
16. How often felt on top of things	2.33 (0.87)	2.37 (0.96)	0.39
17. How often angered by things out of your control	1.79 (1.02)	1.89 (1.23)	0.47
18. How often difficulties piling too high	1.33 (0.96)	1.79 (1.07)	1.20
19. How often not enough energy	1.96 (0.91)	1.74 (0.86)	-0.78
20. How often given yourself quiet time	2.50 (0.83)	1.89 (0.94)	-2.38
21. How often depressed	1.58 (1.10)	1.58 (0.96)	-0.13
22. How often sleep problematic	1.54 (0.88)	1.58 (1.02)	0.03
23. Minutes of exercise per week (past 2 months)	131.7(106.8)	163.4(106.1)	1.08
24. How many times seen doctor	0.50 (0.93)	0.74 (1.05)	0.77
25. How many times used counseling services	0.08 (0.28)	0.16 (0.37)	0.75
26. How often bought self-help books, etc. (2 months)	0.17 (0.48)	0.32 (1.00)	-0.09
27. How often bought self-help teas, etc. (2 months)	0.33 (0.70)	0.42 (0.69)	0.53
28. How often work difficulties (no difficulties = 0)	0.92 (0.93)	0.74 (0.81)	-0.58
29. Anxiety level (no difficulties = 0)	1.67 (1.13)	1.47 (1.17)	-0.50
How satisfied in area of life	5.75 (1.87)	5.05 (2.09)	-0.96
34. Access a coaching program (yes = 1, no = 2)	-	-	-

Standard deviations are in parentheses. N = 36. Z-statistic is from the Wilcoxon ranksum test.