Efficacy of the Fun For Wellness Online Intervention to Promote Multidimensional Well-Being: a Randomized Controlled Trial

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Abstract Subjective well-being refers to people's level of satisfaction with life as a whole and with multiple dimensions within it. Interventions that promote subjective well-being are important because there is evidence that physical health, mental health, substance use, and health care costs may be related to subjective well-being. Fun For Wellness (FFW) is a new online universal intervention designed to promote growth in multiple dimensions of subjective well-being. The purpose of this study was to provide an initial evaluation of the efficacy of FFW to increase subjective well-being in multiple dimensions in a universal sample. The study design was a prospective, double-blind, parallel group randomized controlled trial. Data were collected at baseline and 30 and 60 days-post baseline. A total of 479 adult employees at a major university in the southeast of the USA were enrolled. Recruitment, eligibility verification, and data collection were conducted online. Measures of interpersonal, community, occupational, physical, psychological, economic (i.e., I COPPE), and overall subjective well-being were constructed based on responses to the I COPPE Scale. A two-class linear regression model with complier average causal effect estimation was imposed for each dimension of subjective well-being. Participants who complied with the FFW intervention had significantly higher subjective well-being, as compared to potential compliers in the Usual Care group, in the following dimensions: interpersonal at 60 days, community at 30 and 60 days, psychological at 60 days, and economic at 30 and 60 days. Results from this study provide some initial evidence for both the efficacy of, and possible revisions to, the FFW intervention.

Subjective well-being refers to people's level of satisfaction with life as a whole and with specific dimensions within it (e.g., Chmiel et al. 2012). Interventions that promote subjective well-being are important because there is evidence that physical health (e.g., Keyes and Simoes 2012), mental health (e.g., Wong et al. 2014), substance use (e.g., Griffin et al. 2002), and health care utilization and cost (Harrison et al. 2012) are related to subjective well-being. Therefore, ways to enhance subjective well-being should be of interest to scientists and professionals in the field of prevention and health promotion.

Subjective well-being interventions vary with respect to at least five core design features: (a) target audience (universal, selective, or indicated), (b) target issues (single or multiple), (c) theoretical approach (single or multiple), (d) mode of delivery (face to face, online, or hybrid), and (e) mode of learning (information, skills-building, scenario-based, didactic). In reviewing the literature, we concluded that there was a need to develop a universal (i.e., target audience), online (i.e., mode of delivery), scenario, and skill-based program (i.e., mode of learning) to address multiple domains of well-being (i.e.,

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target issues) through multiple theoretical approaches. While there are successful programs combining a few of these characteristics (e.g., Cobb and Poirier 2014; Prochaska et al. 2012; Roepke et al. 2015), none of them, as far as we could tell, incorporate in a single intervention the potentially powerful mix of online games, interactive chat rooms, and scenario-based learning addressing multiple domains of well-being.

Fun For Wellness (FFW)

FFW is a new online intervention program that uses interactive and scenario-based learning to promote growth in subjective well-being. The efficacy of the Fun For Wellness intervention to increase subjective well-being, however, has yet to be tested. The conceptualization of subjective well-being within FFW is based on the multiple dimensions of subjective well-being purportedly measured by the I COPPE Scale (Prilleltensky et al., 2015): *i*nterpersonal (i.e., satisfaction with the quality of relationships with important people in your life), *c*ommunity (i.e., satisfaction with the community where you live), *o*ccupational (i.e., satisfaction with your main occupation), *p*hysical (i.e., satisfaction with your overall physical health and wellness), *p*sychological (i.e., satisfaction with your emotional life), *e*conomic (i.e., satisfaction with your financial situation) and overall (i.e., satisfaction with the state of affairs in your life). From this point forward for textual parsimony, we generally omit the term "subjective" from the expression "subjective multidimensional well-being."

Target Audience In designing the program, we considered the pressing societal need to promote universal health and well-being and prevent stress, illness, and disease. Preventable conditions related to lifestyle such as obesity and stress afflict millions of people (WHO 2009). Therefore, we saw a need to develop a universal tool for the adult population who would be comfortable with the online platform of FFW. Universal programs have been shown to be effective, for example, in reducing mental health problems in college students (Conley et al. 2015).

Target Issues Overall well-being is highly correlated with satisfaction across I COPPE domains of life (Prilleltensky et al. 2015). Increases in particular domains tend to result in improved general well-being (González et al. 2010). Since the I COPPE domains represent essential elements of well-being, it makes sense to address them all to increase the chances of enhancing overall well-being and, in turn, physical and mental health (Rath and Harter 2010). Interpersonal well-being, for example, is associated with physical health and longevity (Pinker 2014). Poor occupational well-being, in turn, is related to adverse physical and emotional outcomes (Rath and Harter 2010). Interventions aimed at I COPPE domains of well-being

tend to result in better physical and mental health. Programs promoting psychological well-being, for example, have been effective in reducing depression and improving general health and vitality (Proyer et al. 2014).

Theoretical Approaches Based on need and individual differences, different people relate to certain change approaches better than to others (Hays 2014). Moreover, depending on readiness for change, some people benefit from certain techniques more than others (Norcross 2012). Therefore, it is advantageous to leverage the uniqueness of various models of change, especially when the domains of well-being are as varied as I COPPE. For this reason, multiple schools of thought informed seven drivers of change in FFW that form the acronym BET I CAN, which stands for Behaviors, Emotions, Thoughts, Interactions, Context, Awareness, and Next Steps. There are, however, disadvantages related to the multiple approaches infused within the FFW intervention program (e.g., identifying precise mechanisms to explain the potential efficacy of the intervention) and we will attempt to address this important issue in the "Discussion" section.

The B stands for behaviors. FFW teaches participants the basics of habit formation, including antecedents, behaviors, and consequences. Behavioral techniques such as goal setting, behavior tracking, and rewards are taught (Watson and Tharp 2014). The E stands for emotions. Using principles from positive psychology, participants are taught how to build positive emotions and cope with negative ones (Seligman 2011). The T stands for thoughts and is premised on lessons from cognitive behavioral therapy (Hays 2014). The I stands for interactions and builds interpersonal communication skills such as empathy, listening, and assertiveness. The C stands for context and leverage lessons from behavioral economics and design thinking (Dolan 2014). The goal is to create healthier contexts that reduce exposure to risk factors and augment chances of salutary behaviors. The A stands for awareness and aims to increase personal insights. Finally, the N stands for next steps and emphasizes the need to make plans and anticipate barriers.

Mode of Delivery While face to face interventions are effective in preventing serious conditions, they are very labor intensive and limited in reach. The ability to prevent adverse conditions and to enhance healthy behaviors through online interventions creates several opportunities: accessibility, scalability, interactivity, affordability, and fidelity of implementation (Moessner et al. 2016).

Research has shown the efficacy of web-based and mobile interventions in areas such as parenting (Irvine et al. 2015), drug abuse prevention (Schwinn et al. 2010), eating disorders (Moessner et al. 2016), and emotional well-being (Cobb and Poirier 2014; Proyer et al. 2014). An internet program that applied the Transtheoretical Model to stress management and exercise behavior found significant improvements in

overall well-being and emotional health, physical health, healthy behaviors, and life evaluation (Prochaska et al. 2012). A review of randomized controlled trials demonstrated that computer-delivered interventions improved positive knowledge, attitudes, intentions, and behaviors associated with nutrition, tobacco use, substance use, sexual behaviors, and eating disorders (Portnoy et al. 2008). Given the efficacy of previous studies, and advantages associated with internet delivery methods, we chose to create an online intervention.

Mode of Impact In prevention studies, providing skills is more effective than just providing information (Conley et al. 2015). Similarly, scenario-based learning is superior to didactic methods (Irvine et al. 2015). FFW uses both skill-building and scenario-based instruction to generate change.

Each BET I CAN driver of change is translated into action through two skills. We endeavored to identify skills that would capture as much of the various theories as possible, without overwhelming users with an endless list of competencies. As a result, we limited the number of skills to 14. For the *behavior* driver of change, we chose to teach how to set a goal and how to create positive habits. There is evidence that these two skills can be helpful in self-change efforts (Watson and Tharp 2014). For *emotions*, we taught how to cope with negative emotions and how to collect positive emotions, two skills meaningfully associated with overall well-being (Seligman 2011). To teach how *thoughts* can be leveraged to promote well-being, we included two essential skills: how to challenge negative assumptions and how to create a new narrative about our lives (Hays 2014). The *interactions* driver can be optimally used by teaching how to connect and how to communicate. When it comes to *context*, the fifth driver of change, we chose to teach how to read cues and how to change cues in the environment (Dolan 2014). *Awareness*, the sixth driver of change, can be used to promote well-being by learning two competencies: know yourself and know the issue. Finally, to remind participants that change is an ongoing process, we included *next steps* as the seventh driver of change. Here we taught users how to make a plan and how to make it stick (Norcross 2012).

These 14 skills were taught using scenarios in which professional actors played various struggles associated with I COPPE domains of well-being. A total of 36 videos were created to bring to life daily challenges and ways to solve them employing one or more of the skills noted above. To maximize user engagement, we created 16 video games that reinforce the content. In two independent reviews, video games have been shown to help with a wide range of psychological and physical conditions (Primack et al. 2012; Rahmani and Boren 2012). In addition, participants were asked to write personal reflections, interact with others in chat rooms, and listen to or read mini-coaching sessions. In summary, we integrated into one platform multiple means of engagement that have been found to be efficacious in prior research.

Purpose of the Current Study FFW was built to provide people with tools for improving their physical and mental health. Given that (a) well-being is predictive of these outcomes, (b) we now have technologies to reach millions of people through online means, and (c) the literature supports a variety of theories and techniques to produce personal change, we decided to study the efficacy of FFW. The purpose of this study was to provide an initial evaluation of the efficacy of FFW to increase multidimensional well-being in a universal sample.

Method

Study Design

The study design was a prospective, double-blind, parallel group randomized controlled trial. Recruitment, eligibility verification, and data collection were conducted online. All eligible employees at a major research university in the southeast of the USA were recruited via e-mails that they received from the human resource department. Recruiting participants from this pool was consistent with the intended population—an adult population who would be comfortable with the online platform of FFW—but related limitations will be noted in the "Discussion" section. Eligibility criteria were (a) greater than or equal to age 18 years and (b) employed at the university. Exclusion criteria were (a) less than age 18 years and (b) not employed by the university. Individuals less than age 18 years were excluded because the FFW content was created for adults. Individuals who were not employed by the university were excluded to control access to the online intervention. Multidimensional well-being data were collected at baseline (T1), 30 days post-baseline (T2), and 60 days post-baseline (T3), which followed a similar timeline used in well-being interventions (e.g., Cobb and Poirier 2014). Data on proposed pretreatment demographic covariates of multidimensional well-being (Rubenstein et al. 2016) were collected at T1 and included participant gender, age, race, education level, marital status, and salary. Upon completion of the battery, each participant received an Amazon electronic gift card worth $10 at T1, an additional $15 at T2, and an additional $25 at T3.

Random assignment to the intervention (FFW) or usual care (UC) groups was determined by computer software that was specified to achieve a 1:1 group (i.e., FFW/UC) assignment. Participants who were randomly assigned to the UC group were provided with 30 days (i.e., from T1 to T2) of 24 h access to a webpage that provided links to several well-established websites (e.g., http://www.centreforconfidence.co.uk/flourishing-lives.php?pid=454) that collectively focused

on multidimensional well-being. A complete list of the links that were provided to participants assigned to the UC group is available upon request to the corresponding author.

Participants who were randomly assigned to the FFW group were provided with 30 days (i.e., from T1 to T2) of 24 h access to up to 152 challenges designed to promote multidimensional well-being. Each challenge was designed by the research team (i.e., authors of the current manuscript) and required participants to do one of the following activities: (a) watch vignettes performed by professional actors, (b) watch and/or read mini-lectures narrated by a coach, (c) engage in self-reflection exercises and chat rooms, and (d) play interactive games. Four challenges focused on introductory material (e.g., orientation to the website, an introduction to the characters that appear in the vignettes, etc.) and had to be completed in order to gain access to the remaining 148 post-introductory challenges. Post-introductory challenges were organized on the website by the seven proposed BET I CAN drivers of potential change in multidimensional well-being. Participants were not told how many challenges to complete and self-selected which post-introductory challenges to complete. Challenges completed by each participant were tracked by computer software to provide data for a participation scoring system. This tracking was possible because accessing the intervention always required each participant to use her/his unique and secure log-in information. The completion of challenges was viewed as evidence of engagement with the FFW intervention.

Participant Characteristics

Figure 1 depicts participant flow from screening to randomization to retention over the three measurement occasions, which occurred from June 2015 to August 2015. A total of 479 eligible participants were randomized to UC ($n = 242$) or FFW ($n = 237$). Table 1 provides a comparison of demographic characteristics and well-being scores at baseline for participants by randomization group. There were no statistically significant differences in the proportions of demographic characteristics or mean well-being scores at baseline by randomization group. A majority of the participants were full-time employees (96.6%), female (76%), Hispanic or White, non-Hispanic (81.8%), and earned a salary of greater than or equal to $50,000 (65.3%).

Multidimensional Well-Being

Multidimensional well-being was measured with the 21 items that define the I COPPE Scale (Prilleltensky et al. 2015) at T1, T2, and T3. Each of the seven dimensions of well-being—interpersonal, community, occupational, physical, psychological, economic, and overall—was measured with a unique item stem that referenced three different time periods: past,

present, and future. Responses to all items followed an 11-category rating scale structure: from 0 (*worst your life can be*) to 10 (*best your life can be*). Previous studies have provided some initial evidence within cross-sectional study designs for the reliability of scores derived from responses to the I COPPE Scale (e.g., Myers et al. 2014; Myers et al. 2016). In Myers et al. (2014), Cronbach's alpha reliability estimates of I COPPE well-being scores ranged from .87 (economic) to .93 (community). In Myers et al. (2016), Cronbach's alpha reliability estimates of I COPPE well-being scores ranged from .82 (economic) to .88 (interpersonal).
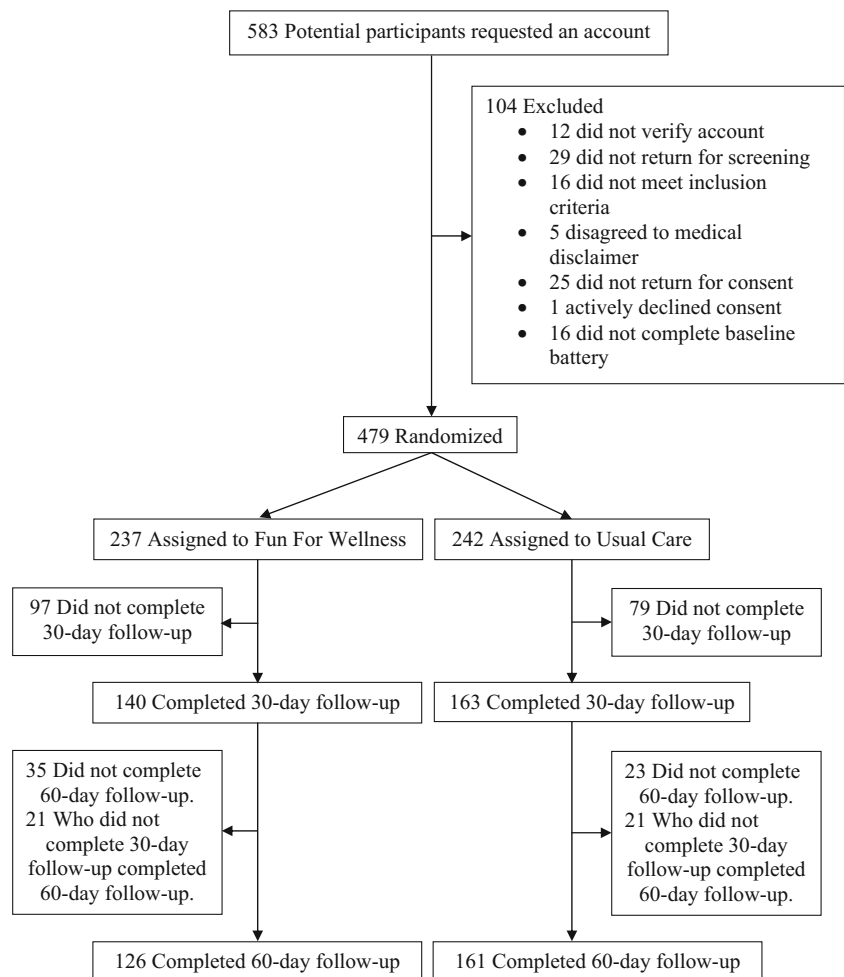
In the current study, an average observed score for each of the seven dimensions of well-being was created and was consistent with previous research (Myers et al. 2014). McDonald's (1970) coefficient omega ranged from .81 to .86 for interpersonal well-being, .86 to .90 for community well-being, .73 to .75 for occupational well-being, .78 to .80 for physical well-being, .78 to .80 for psychological well-being, .79 to .81 for economic well-being, and .70 to .73 for overall well-being across the three time points. The test-retest reliability coefficient, as measured by the intraclass correlation coefficient, ranged from .82 (community) to .89 (economic). Limitations of the reliability coefficients reported in this study included the time (e.g., 30 days) between repeated measures and the fact that two of the repeated measures occurred after random assignment to UC or FFW.

Compliance

For the purpose of measuring level of user participation in the FFW group, a scoring system was created by the research team, which consisted of both substantive and methodological experts. The potential impact of completing a particular challenge was classified as low (7 points), moderate (14 points), or high (21 points). Participation points for completing a particular challenge were further allocated by the dimension(s) of well-being that the challenge was focused on. For example, completing challenge 6 earned a participant 7 participation points in physical well-being because this challenge was classified as low impact and focused on physical well-being only. Full participation (i.e., compliance) in a particular dimension of well-being was defined as (a) completing the four introductory challenges and (b) earning at least 21 additional participation points (i.e., the equivalent of a major post-introductory challenge) in the identified dimension of well-being. The construction of a definition of full participation for each dimension of well-being was based on both substantive (e.g., it would take approximately 2 h of interacting with FFW to earn sufficient participation points) and methodological (e.g., the presence of some compliers) considerations (e.g., Stuart et al. 2008).

The number of participants who were randomized to the FFW group and were classified as a complier varied by dimension of well-being and ranged from 37 (or 15.6%) for

Fig. 1 Participant flow from screening to randomization to retention over the three measurement occasions

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                          ┌──────────────────────────────────────────┐
                          │ 583 Potential participants requested an account │
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                                            │
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                          │ 104 Excluded                              │
                          │   • 12 did not verify account             │
                          │   • 29 did not return for screening       │
                          │   • 16 did not meet inclusion             │
                          │       criteria                            │
                          │   • 5 disagreed to medical                │
                          │       disclaimer                          │
                          │   • 25 did not return for consent         │
                          │   • 1 actively declined consent           │
                          │   • 16 did not complete baseline          │
                          │       battery                             │
                          └──────────────────────────────────────────┘

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                          │   479 Randomized      │
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237 Assigned to Fun For Wellness — 242 Assigned to Usual Care

97 Did not complete 30-day follow-up — 79 Did not complete 30-day follow-up

140 Completed 30-day follow-up — 163 Completed 30-day follow-up

35 Did not complete 60-day follow-up. 21 Who did not complete 30-day follow-up completed 60-day follow-up. — 23 Did not complete 60-day follow-up. 21 Who did not complete 30-day follow-up completed 60-day follow-up.

126 Completed 60-day follow-up — 161 Completed 60-day follow-up

community well-being to 130 (or 54.9%) for overall well-being. A comparison of observed demographic characteristics and well-being scores at baseline for participants who were randomized to the FFW group by compliance classification revealed that only 7 out of 56 of these comparisons were statistically significant (see online materials for the full table). The proportion of females was significantly larger in the complying group as compared to the non-complying group for community (i.e., 89.2% versus 72.5%), psychological (i.e., 86.7% versus 71.2%), and economic (i.e., 89.7% versus 72.2%) well-being. The proportion of participants earning a salary ≥$50,000 was significantly smaller in the complying group as compared to the non-complying group for community (i.e., 45.9% versus 68.0%) and economic (i.e., 48.7% versus 67.7%) well-being. The proportion of married participants was significantly smaller in the complying group as compared to the non-complying group for community well-being (i.e., 24.3% versus 50.5%).

The mean economic well-being at baseline was significantly lower in the complying group as compared to the non-complying group (i.e., 6.31 versus 6.97). Most of the seven statistically significant comparisons by compliance classification were observed in either community (three) or economic (three) well-being. There were no statistically significant comparisons by compliance classification for interpersonal, occupational, physical, and overall well-being.

Data Analytic Approach

Three general models were fit in M*plus* 7.31 (Muthén and Muthén 1998–2012) under maximum likelihood (ML) estimation with robust standard errors. The primary purpose of each model was to estimate the effect of the FFW intervention to increase multidimensional well-being in a universal sample over time and under some alternative model specifications (Jo 2002a). An effect size was calculated by dividing the mean difference by the square root of the variance pooled across the UC and FFW groups. Model 0 estimated the effect of being assigned to the FFW intervention (i.e., the intent-to-treat, ITT effect). Model 1 estimated the effect of being assigned to the FFW intervention for those who fully participated in the FFW intervention (i.e., the ITT_c effect). Model 2 estimated the ITT_c

Table 1 Comparison of observed demographic characteristics and well-being (WB) scores at baseline for participants by randomization group

Variable	Usual care		Fun For Wellness	
	%		%	
Female	76.9		75.1	
Hispanic	46.3		44.3	
White, non-Hispanic[a]	36.4		36.7	
Has a graduate degree	48.4		46.9	
Married	49.2		46.4	
Salary ≥$50,000	66.5		64.4	
	M	SD	M	SD
Age in years	41.93	11.77	41.58	11.60
Interpersonal WB	7.84	1.54	7.86	1.56
Community WB	7.43	1.66	7.71	1.64
Occupational WB	7.29	1.50	7.14	1.50
Physical WB	7.22	1.56	7.25	1.51
Psychological WB	7.37	1.67	7.37	1.59
Economic WB	6.99	1.53	6.88	1.57
Overall WB	7.29	1.36	7.30	1.24

Missing data for demographic characteristics was .002% (gender), .004% (race), .002% (education-level), .002% (marital status), and .004% (salary)

[a] African-American (UC = 8.3%, FFW = 8.0%), Asian (UC = 5.4%, FFW = 5.9%), and other (UC = 3.3%, FFW = 4.2%) were also selected

effect and the effect of being assigned to the FFW intervention for those who did not fully participate in the FFW intervention (i.e., ITT_n). Model 1 and model 2 employed complier average causal effect (CACE; e.g., Angrist et al. 1996; Bloom 1984) estimation. Missing data were handled with the default approach under the assumption that data were missing at random (Jo et al. 2010). Type I error rate was set to equal .05 for each null hypothesis test. A post hoc correction to type I error rate was not applied in an effort to preserve power to detect a truly false null hypothesis. An inflated type I error rate, however, was possible and therefore effect size also was evaluated.

Model 0 imposed a regression model for each dimension of well-being with well-being at T2 and T3 as the outcome variables. The demographic covariates, well-being at T1, and treatment assignment (UC = 0, FFW = 1) were specified as predictors of well-being at T2 and T3 and these regression coefficients were freely estimated. The intercepts for well-being at T2 and T3 were freely estimated. Residual (co-)variances for well-being at T2 and T3 were freely estimated. The direct effects from treatment assignment directly to well-being at T2 and T3 (i.e., the ITT effects) were the focal parameters and a positive value indicated that the FFW group had a higher adjusted mean for well-being as compared to the UC group. The expression "adjusted mean" is used to acknowledge the statistical adjustment made by including the covariates in the model. Model 0

can be summarized in equation form for participant i as:

$$y_i = \alpha + \gamma z_i + \lambda_1 x_{1i} + \lambda_2 x_{2i} + \lambda_3 x_{3i} + \lambda_4 x_{4i} + \lambda_5 x_{5i} + \lambda_6 x_{6i} + \lambda_7 x_{7i} + \lambda_8 x_{8i} + \varepsilon_i \quad (1)$$

where

y_i is a dimension of well-being at T2 or T3

α is an intercept

γ is the ITT effect

z is treatment assignment (UC = 0, FFW = 1)

λ_k is the regression coefficient for the kth covariate

x_1 is the relevant dimension of well-being at T1

x_2 is female (male = 0, female = 1)

x_3 is age

x_4 is Hispanic (not Hispanic = 0, Hispanic = 1)

x_5 is White non-Hispanic (not White non-Hispanic = 0, White non-Hispanic = 1)

x_6 is graduate degree (no graduate degree = 0, graduate degree =1)

x_7 is married (not married = 0, married = 1)

x_8 is salary (<$50,000 = 0, ≥$50,000 = 1)

ε_i is the residual

In Eq. 1 and in subsequent equations, we adopted a notation system used in Jo (2002a). For textual parsimony, only unique notations are defined from this point forward.

Model 1 imposed a two-class regression model with CACE estimation for each dimension of well-being with well-being at T2 and T3 as the outcome variables. Class 1 was conceptualized as the never-taking class. Class 2 was conceptualized as the complier class. A binary latent class indicator was created where compliers (i.e., at least 21 post-introductory participation points in the identified dimension of well-being) in the FFW group had a value of 1, non-compliers (i.e., less than 21 post-introductory participation points in the identified dimension of well-being) in the FFW group had a value of 0, and participants in the UC group had a missing value. The categorical latent variable representing compliance classification was regressed on the demographic covariates. The demographic covariates, well-being at T1, and treatment assignment were specified as predictors of well-being at T2 and T3 and these regression coefficients were allowed to vary in each class. The two direct effects from treatment assignment to well-being at T2 and T3 were fixed to 0 in class 1 (i.e., the exclusion restrictions) and were freely estimated in class 2. The intercepts for well-being at T2 and T3 were allowed to vary in each class. Residual (co-)variances for well-being at T2 and T3 were allowed to vary in each class. The direct effects from treatment assignment to well-being at T2 and T3 in class 2 (i.e., the ITT_c effects) were the focal parameters and a positive value indicated that compliers in the FFW group had a higher adjusted mean for well-being as compared to compliers in the UC group.

The logistic regression of compliance for each dimension of well-being on the demographic covariates within model 1 can be summarized in equation form as:

$$P[i \in C(c)|\mathbf{x}_i] = \pi_{ci}$$
$$P[i \in C(n)|\mathbf{x}_i] = 1 - \pi_{ci}$$
$$\text{logit}(\pi_{ci}) = \beta_0 + \boldsymbol{\beta}' \mathbf{x}_i \tag{2}$$

where c is complier, π_{ci} is the probability of being a complier for participant i, n is never-taker, $\mathbf{x}_i$ is a vector of demographic covariates (i.e., x_2 through x_8 as defined in Eq. 1) for participant i, β_0 is an intercept, and $\boldsymbol{\beta}$ is a vector of regression coefficients.

Building off Eq. 2 and letting $c_i = 0$ and $n_i = 1$ if $i \in C(n)$ and $c_i = 1$ and $n_i = 0$ if $i \in C(c)$, the outcome regression model for each dimension of well-being within model 1 for participant i with compliance status c_i and n_i can be summarized in equation form as:

$$y_i = \alpha_n n_i + \alpha_c c_i + \gamma_n n_i z_i + \gamma_c c_i z_i + \boldsymbol{\lambda}'_n n_i \mathbf{x}_i + \boldsymbol{\lambda}'_c c_i \mathbf{x}_i$$
$$+ \varepsilon_{in} n_i + \varepsilon_{ic} c_i \tag{3}$$

where subscripts n and c denote the never-taker class and the complier class, respectively, γ_c is the ITT$_c$ effect, and γ_n is the ITT$_n$ effect and is fixed to zero in model 1.

Model 1 relied on a set of key assumptions in order to estimate the ITT$_c$ effects (see, for example, Angrist et al. 1996, for a thorough explanation). First, the stable unit treatment value assumption (Rubin 1978) was adopted and implied that well-being at T2 and T3 for each participant was not affected by the treatment assignment of any other participant. Second, it was assumed that being given the opportunity to participate was randomly assigned. Third, it was assumed that being assigned to the FFW intervention would induce at least some of these individuals to fully participate. Fourth, the monotonicity assumption was adopted and implied that assignment to the FFW group could only increase participation in the intervention (i.e., there were no defiers). Finally, the exclusion restrictions were adopted and implied that there was no effect of treatment group assignment for never-takers (i.e., individuals who would not participate in the FFW intervention irrespective of group assignment) or always-takers (i.e., individuals who would participate in the FFW intervention irrespective of group assignment). Further, the fact the study design required a participant to have a unique and secure log-in to access the FFW intervention may have made the presence of always-takers unlikely in the UC group.

Model 2 estimated all of the parameters specified in model 1 while removing the exclusion restriction for never-takers. More specifically, the γ_n (i.e., the ITT$_n$ effect) in Eq. 3 was freely estimated in model 2 along with all of the other parameters estimated in model 1. Model 2 was viewed as a sensitivity analysis.

Results

Model 0

Table 2 provides the adjusted mean differences in each dimension of well-being for FFW ($n = 220$) versus UC ($n = 226$) participants over time (both without and with the demographic covariates in the model). For each dimension of well-being, the ITT effect at T2 and at T3 was statistically non-significant and ranged from $-.22$ (effect size = $-.14$) for psychological well-being at T2 to .23 (effect size = .15) for economic well-being at T2. More broadly, the FFW group had an approximately equal adjusted mean for well-being as compared to the UC group at T2 and at T3 for each dimension of well-being. In summary, there was evidence that the effect of simply being assigned to the FFW intervention, without considering actual participation in the FFW intervention, was a null effect at T2 and at T3 for each dimension of well-being.

Model 1 and Model 2

CACE results from model 2 were quite consistent with CACE results from model 1. Given this consistency, and the plausibility of the exclusion restrictions in this study, the results from only model 1 are discussed from this point forward. A full set of parameter estimates from each model is available by request to the corresponding author.

Compliance None of the demographic covariates were statistically significant predictors of compliance for interpersonal, occupational, physical, psychological, and overall well-being. Earning a salary $\geq\$50,000$, however, was a statistically significant predictor ($b = .85$, $p = .024$) of compliance for community well-being and economic well-being ($b = .84$, $p = .014$). The estimated odds of being a complier were 2.34 times (and 2.31 times) higher for higher wage earners as compared to lower wage earners for community (and economic) well-being.

Well-Being Table 2 provides adjusted mean difference estimates from model 1 for each dimension of well-being at T2 and T3. The paragraphs below briefly interpret these estimates for each dimension of well-being. A table is available online that provides estimates of covariates at T2 and T3 for each dimension of well-being, but these results are not discussed in the text.

Interpersonal Well-Being The ITT$_c$ effect, 0.48 (effect size = .32), was not statistically significant at T2, $p = .267$. The ITT$_c$ effect (1.19 (effect size = .80)) was statistically significant at T3 ($p = .042$). The adjusted mean at T3 for compliers assigned to the UC group equaled 6.18, while the adjusted mean at T3 for compliers assigned to the FFW group equaled 7.37.

Table 2 Adjusted mean differences in each dimension of well-being for Fun for Wellness versus usual care participants

Well-being (WB)	Intent-to-treat analysis without demographic covariates	Intent-to-treat analysis	Complier average causal effect estimates Compliers
	Estimate (SE)	Estimate (SE)	Estimate (SE)
Interpersonal WB			
Time 2	−.17 (.13)	−.16 (.13)	.48 (.43)
Time 3	.06 (.14)	.06 (.14)	1.19 (.58)*
Community WB			
Time 2	−.02 (.14)	−.01 (.14)	1.16 (.49)*
Time 3	−.09 (.16)	−.07 (.16)	.94 (.47)*
Occupational WB			
Time 2	.03 (.12)	.08 (.12)	.17 (.17)
Time 3	.06 (.14)	.07 (.14)	.31 (.36)
Physical WB			
Time 2	−.18 (.11)	−.13 (.11)	−.04 (.15)
Time 3	−.04 (.12)	−.03 (.12)	.18 (.23)
Psychological WB			
Time 2	−.24 (.13)	−.22 (.13)	.06 (.24)
Time 3	.03 (.13)	.03 (.13)	.81 (.31)**
Economic WB			
Time 2	.19 (.13)	.23 (.13)	1.35 (.50)**
Time 3	.21 (.14)	.20 (.14)	1.48 (.42)***
Overall WB			
Time 2	−.22 (.12)	−.18 (.12)	.00 (.16)
Time 3	−.02 (.13)	−.02 (.13)	.11 (.19)

*$p < .05$, **$p < .01$, ***$p < .001$

Community Well-Being The ITT_c effect (1.16 (effect size = .71)) was statistically significant at T2 ($p = .019$). The adjusted mean at T2 for compliers assigned to the UC group equaled 6.78 while the adjusted mean at T2 for compliers assigned to the FFW group equaled 7.94. The ITT_c effect (.94 (effect size = .59)), was statistically significant at T3 ($p = .046$). The adjusted mean at T3 for compliers assigned to the UC group equaled 6.94 while the adjusted mean at T3 for compliers assigned to the FFW group equaled 7.87.

Occupational Well-Being The ITT_c effect (.17 (effect size = .12) was not statistically significant at T2 ($p = .322$). The ITT_c effect (.31 (effect size = .22)) was not statistically significant at T3 ($p = .382$).

Physical Well-Being The ITT_c effect (−.04 (effect size = −.03)) was not statistically significant at T2 ($p = .809$). The ITT_c effect (.18 (effect size = .13)) was not statistically significant at T3 ($p = .414$).

Psychological Well-Being The ITT_c effect (.06 (effect size = .04)) was not statistically significant at T2 ($p = .795$). The ITT_c effect (.81 (effect size = .56)) was statistically significant at T3 ($p = .009$). The adjusted mean at T3 for compliers assigned to the UC group equaled 5.54, while the adjusted mean at T3 for compliers assigned to the FFW group equaled 6.35.

Economic Well-Being The ITT_c effect (1.35 (effect size = .85)) was statistically significant at T2 ($p = .007$). The adjusted mean at T2 for compliers assigned to the UC group equaled 4.07, while the adjusted mean at T2 for compliers assigned to the FFW group equaled 5.42. The ITT_c effect (1.48 (effect size = .94)) was statistically significant at T3 ($p < .001$). The adjusted mean at T3 for compliers assigned to the UC group equaled 6.12, while the adjusted mean at T3 for compliers assigned to the FFW group equaled 7.60.

Overall Well-Being The ITT_c effect (.00 (effect size = .00)) was not statistically significant at T2 ($p = .988$). The ITT_c effect (.11 (effect size = .09)) was not statistically significant at T3 ($p = .570$).

Discussion

The purpose of this study was to provide an initial evaluation of the efficacy of FFW in increasing multidimensional well-being in a universal sample. There was evidence that the effect

of simply being assigned to the FFW intervention, without considering actual participation in the FFW intervention, was a null effect for each dimension of well-being. For compliers with the intervention, however, results from this study provide some initial evidence for the efficacy of the FFW online intervention to increase well-being in the following domains: interpersonal, community, psychological, and economic. That said, results from this study also provide some initial evidence for the inefficacy of the FFW online intervention to increase well-being in the following domains for compliers: occupational, physical, and overall. These results are consistent with previous studies. Cobb and Poirier (2014), for example, found improvements in emotional health but did not see changes in physical health or work environment. Consistent with Cobb and Poirier, we believe that changes in these domains of life may take longer than the timeframe used in this study. Other studies also found positive changes in psychological well-being using online games and exercises similar to the ones in FFW (Proyer et al. 2014; Roepke et al. 2015).

In addition to the positive changes in psychological well-being observed in this study, compliers also improved their interpersonal, community, and economic well-being. In light of the documented positive effects of interpersonal and community well-being on physical and psychological health, this is a very encouraging result (Pinker 2014). Since FFW is a skill-based intervention, it is likely that participants experienced enhanced self-efficacy in these domains, which, in turn, translated into higher scores in interpersonal, community, psychological, and economic well-being. Indeed, the BET I CAN drivers of change and their corresponding 14 skills were specifically designed to help people in the I COPPE domains of life. Future studies with longer follow-up periods could determine if physical, occupational, and overall well-being also improve with the passage of time.

In addition to the positive impact of FFW on interpersonal, community, psychological, and economic well-being, there may be potential financial implications as well for employers and society at large. Previous studies have documented the role of well-being in health care cost and utilization, productivity, and retention. These studies have shown that improvements in well-being predict lower health care utilization and costs (Harrison et al. 2012) and that well-being at baseline predicted total health care expenditure, emergency room visits, hospitalizations, unscheduled absences, short-term disability leave, presenteeism, performance, intention to stay, and voluntary and involuntary turnover over the period of 12 months (Sears et al. 2013).

We are aware of five primary limitations for this initial evaluation of the efficacy of FFW to increase multidimensional well-being. The first limitation is uncertainty regarding the efficacy of our definition of "full" participation. While the construction of the definition of full participation in the current study was based on both substantive and methodological considerations, we suggest ongoing efforts—such as qualitative interviews with participants and/or asking each participant at baseline to make a projection about her/his compliance behavior during the subsequent intervention (e.g., Jo 2002b)—to deepen our understanding of compliance with the FFW intervention. As other studies have demonstrated, it can be difficult to achieve high levels of adherence for internet-based interventions, but once compliance is secured, positive results may ensue (Couper et al. 2010).

The second limitation of the current study is that we modeled only direct (or equivalently, "overall") effects of treatment and did not investigate possible mechanisms (e.g., BET I CAN drivers of change) through which the FFW intervention may indirectly influence multidimensional well-being. Future research that develops a scale to measure BET I CAN beliefs and provides validity evidence for measures derived from responses to this scale is recommended as an important next step to better understand why the FFW may be efficacious in some instances. The third limitation of the current study is that we assumed additivity of treatment effects for all demographic covariates. Secondary data analyses that explore the possibility of differential treatment effects for observed subgroups of participants are encouraged. The fourth limitation is that the data were not analyzed in a longitudinal framework, in part, because the "sample size" in the complier class was quite modest (e.g., less than 100) for some dimensions of well-being (e.g., community) which made the potential quality and precision of the estimation of random effects uncertain. Another modeling consideration was that we are not sure that the true form of trajectories would be linear in this design and estimating a non-linear form with random effects may pose issues with identification in this design. Future research that models growth trajectories, perhaps with several repeated measures, is encouraged.

A final limitation of the current study is the relatively narrow population from which the sample was drawn. Given that the study was conducted with university employees and many participants held graduate degrees, a more diverse sample with a wider range of educational attainment may provide different results. Future research that samples from one or more broader populations would more fully evaluate the efficacy of the FFW online universal intervention.

Compliance with Ethical Standards

Conflict of Interest Adam McMahon and Isaac Prilleltensky are partners in Wellnuts LLC, which may commercialize the FFW intervention described in this study.

Ethical Approval   All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. The institutional review board at the University of Miami provided necessary permission to conduct this study, IRB no. 20150237.

Informed Consent   Informed consent was obtained from all individual participants included in the study. More specifically, immediately after passing the inclusionary criteria, screened respondents were presented with the IRB-approved consent form to read and sign electronically. Those who clicked "decline to consent" were locked out of the remaining program activities.

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