

USING ORGANISMIC INTEGRATION THEORY TO EXPLORE THE ASSOCIATIONS BETWEEN USERS' EXERCISE MOTIVATIONS AND FITNESS TECHNOLOGY FEATURE SET USE

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Appendix A

Developing the Fitness Technology Feature Sets

Fitness technology feature use items were not available in the literature, and thus, were developed for the current study. Items were developed for each feature set following the procedure described next. We used a four-step process to determine the fitness technology features that make up our first-order subconstructs. First, we compiled a list of currently available fitness devices and their associated apps using lists of wearables published in popular media outlets. The original list contained 72 devices and was compiled using lists of wearables from CNET, *PC Magazine*, *The Wall Street Journal*, Engadget, Gizmodo, and others. While not comprehensive, the redundancy across multiple lists suggests that our list, at the very least, contains the most popular devices in the wearables category at the time the data was collected. Second, the three researchers independently visited every website of each device/app on the list and collected the features the company advertised for the fitness technology. Third, all three of the researchers' feature lists were compared, discussed, and used to create an integrated list. Fourth, once survey items were created, an expert panel was convened to examine the feature list and scales as described below.

Accepted procedural methods (Churchill 1979; MacKenzie et al. 2011) were followed in developing the fitness technology use items. Once the items were developed, an expert panel was convened. The expert panel consisted of two faculty members who are well versed in survey-based methodologies, two faculty members who were active users of fitness technologies, and two employees of a fitness technology company. The expert panel was instructed to examine the entire survey instrument for clarity and to provide feedback on wording and note if any fitness technology features were missing. The expert panel did not provide any new fitness technology features, which indicated our list was reasonably comprehensive. The expert panel did suggest wording changes to the fitness technology features set use items and the addition of a few more fitness device and apps to our list (primarily new versions of devices already present in our list). We compiled the expert panel wording suggestions and considered each suggestion. Most wording suggestions from the expert panel were implemented, improving the clarity of the survey items.

Appendix B

Items

Table B1. Items with References and Descriptive Statistics			
Name	Item	Mean	Std. Dev.
Motivation Items (BREQ-3) (from Markland and Tobin 2004; Wilson et al. 2006)			
Prompt: Why do you engage in exercise? (5-point Likert Scale; 1 = Not at all true for me to 5 = Completely true for me)			
Amot1	I don't see why I should have to exercise.	1.76	1.174
Amot2	I can't see why I should bother exercising.	1.73	1.158
Amot3	I don't see the point in exercising.	1.69	1.160
Amot4	I think exercising is a waste of time.	1.65	1.163
ExtReg1	I take part in exercise because my friends/family/partner say I should.	2.26	1.321
ExtReg2	I exercise because others will not be pleased with me if I don't.	2.07	1.265
ExtReg3	I feel under pressure from my friends/family to exercise.	2.19	1.312
ExtReg4	I exercise because other people say I should.	2.14	1.257
InjReg1	I feel ashamed when I miss an exercise session.	2.86	1.266
InjReg2	I feel like a failure when I haven't exercised in a while.	3.12	1.302
InjReg3	I would feel bad about myself if I was not making time to exercise.	3.30	1.225
InjReg4	I feel guilty when I don't exercise.	3.20	1.243
IdReg1	It's important to me to exercise regularly.	3.78	1.079
IdReg2	I value the benefits of exercise.	4.03	0.982
IdReg3	I think it is important to make the effort to exercise regularly.	3.91	0.968
IdReg4	I get restless if I don't exercise regularly.	3.15	1.285
IngReg1	I consider exercise part of my identity.	3.15	1.343
IngReg2	I consider exercise a fundamental part of who I am.	3.21	1.303
IngReg3	I consider exercise consistent with my values.	3.54	1.116
IngReg4	I exercise because it is consistent with my life goals.	3.65	1.093
IntReg1	I enjoy my exercise sessions.	3.59	1.098
IntReg2	I find exercise a pleasurable activity.	3.49	1.146
IntReg3	I exercise because it's fun.	3.26	1.240
IntReg4	I get pleasure and satisfaction from participating in exercise.	3.69	1.068
Fitness Technology Use Items: Developed for Current Study			
Prompt: I use (or have used) an exercise device and/or application (app) to: (5-point Likert Scale; 1 = Strongly Disagree to 5 = Strongly Agree)			
Share1	share my exercise statistics with other people.	2.74	1.337
Share2	share my exercise information with other people.	2.78	1.338
Share3	share my exercise data in a public forum (e.g., leaderboard, ranking, social media).	2.56	1.328
Share4	share my exercise accomplishments for other people to see.	2.71	1.321
Encourage1	have other people encourage my exercise activities.	2.76	1.339
Encourage2	receive encouraging messages regarding my exercise activities from others.	2.67	1.337
Encourage3	have my exercise accomplishments acknowledged by other people.	2.83	1.323
Encourage4	receive moral support for my exercise activities from others.	2.80	1.304
Coach1	get coaching from a live personal trainer.	2.31	1.267
Coach2	receive expert advice about my exercise regimen from a live coach.	2.40	1.287
Coach3	obtain feedback from a live coach about how my exercise activities are going.	2.35	1.281
Coach4	have a live coach guide me through my exercise regimen.	2.34	1.278

Compare1	compare my exercise activities to other people's exercise activities.	2.79	1.326
Compare2	see how other people's exercise activities compare to mine.	2.84	1.329
Compare3	compare my exercise activities to the exercise activities of others.	2.80	1.329
Compare4	track my exercise activities with respect to how they compare to others.	2.84	1.323
Compare5	rank my exercise activities relative to others' exercise activities.	2.72	1.306
Compete1	compete with other people.	2.69	1.339
Compete2	challenge other individuals to exercise competitions.	2.61	1.319
Compete3	have exercise contests with other individuals.	2.66	1.363
Compete4	enter into exercise competitions with others.	2.59	1.332
Goals1	set my exercise goals.	3.95	0.946
Goals2	establish my exercise goals.	3.93	0.941
Goals3	develop goals for my exercise.	3.91	0.954
Goals4	create my exercise goals.	3.89	0.963
Remind1	remind me to do an exercise activity.	3.28	1.245
Remind2	notify me to perform an exercise activity.	3.18	1.261
Remind3	provide me with reminders when I need to do an exercise activity.	3.22	1.243
Remind4	prompt me when I need to perform an exercise activity.	3.19	1.221
Rewards1	receive rewards (e.g., discounts, points, badges, etc.) for my exercise activities.	2.69	1.323
Rewards2	obtain rewards (e.g., discounts, points, badges, etc.) for my exercise activities.	2.63	1.312
Rewards2	win prizes (e.g., discounts, points, badges, etc.) for my exercise activities.	2.56	1.321
Rewards4	earn prizes (e.g., discounts, points, badges, etc.) for my exercise activities.	2.62	1.332
Analyze1	manage my exercise data.	3.97	0.903
Analyze2	observe patterns in my exercise data.	3.76	0.996
Analyze3	analyze my exercise data.	3.90	0.949
Analyze4	calculate trends from my exercise data.	3.73	1.043
Analyze5	graph my exercise data.	3.86	1.009
Collect1	gather my exercise data.	4.06	0.840
Collect2	collect my exercise information.	4.11	0.802
Collect3	record my exercise data.	4.17	0.801
Collect4	accumulate my exercise data.	4.04	0.835
Updates1	provide me with messages about my exercise progress.	3.51	1.103
Updates2	give me visual cues (e.g., status bar, colors) about my exercise progress.	3.85	1.032
Updates3	provide me with exercise progress updates.	3.76	1.010
Updates4	update me with the status of my exercise progress.	3.82	0.984
Search1	search for exercise information(e.g., exercise routes, new exercise routines, etc.).	3.30	1.244
Search2	access exercise information (e.g., exercise routes, new exercise routines, etc.).	3.38	1.223
Search3	find exercise information (e.g., exercise routes, new exercise routines, etc.) that is relevant to me.	3.37	1.235
Search4	browse exercise information (e.g., exercise routes, new exercise routines, etc.).	3.35	1.218
Subjective Vitality Items (from Bostic et al. 2000; Ryan and Frederick 1997)			
Prompt: Please respond to each of the following statements by indicating the degree to which the statement is true for you when engaged in exercise.			
(5-point Likert Scale; 1 = Not at all true for me to 5 = Completely true for me)			
Vitality1	I feel alive and vital.	3.60	1.059
Vitality2	Sometimes I feel so alive I just want to burst.	2.93	1.282
Vitality3	I have energy and spirit.	3.61	1.062
Vitality4	I look forward to each new day.	3.63	1.066
Vitality5	I nearly always feel alert and awake.	3.39	1.130
Vitality6	I feel energized.	3.55	1.103

Appendix C

Details of Statistical Testing

Convergent Validity

To confirm convergent validity, all items “thought to reflect a construct converge, or show significant, high correlations with one another, particularly when compared to the items relevant to other constructs” (Straub et al. 2004, p. 391). In order to establish convergent validity in PLS, a bootstrap is run and the outer loadings and associated t-statistics are examined, along with the cross-loading matrix. The outer-loadings and t-statistics for our measurement model are given in Table C1 and the cross-loading matrix is shown in Table C2. The outer-loadings for most of our items in Table C1 are above 0.7, which is recommended, although for large sample sizes loadings above 0.3 are adequate (Hair et al. 2006). All items were retained because their loadings were adequate and their t-statistics indicated that the loadings were significant, indicating convergent validity.

Table C1. Outer Loadings and t-statistics

Construct	Item	Outer Loading	t-statistic	Construct	Item	Outer Loading	t-statistic
Nonregulation	Amot1	0.886	69.113	Social Comparison	Compare1	0.915	108.942
	Amot2	0.897	98.405		Compare2	0.914	115.230
	Amot3	0.906	86.352		Compare3	0.916	111.796
	Amot4	0.880	66.840		Compare4	0.887	78.675
External Regulation	ExtReg1	0.874	73.189		Compare5	0.888	76.823
	ExtReg2	0.883	96.558	Social Competition	Compete1	0.918	131.936
	ExtReg3	0.860	62.212		Compete2	0.932	140.902
	ExtReg4	0.842	59.523		Compete3	0.937	179.126
Introjected Regulation	InjReg1	0.829	46.229		Compete4	0.930	126.877
	InjReg2	0.846	62.949	Goal Management	GoalMgmt1	0.866	66.425
	InjReg3	0.791	36.455		GoalMgmt2	0.874	70.996
	InjReg4	0.862	71.751		GoalMgmt3	0.816	43.943
Identified Regulation	IdReg1	0.859	67.568		GoalMgmt4	0.849	52.303
	IdReg2	0.788	45.230	Reminders	Remind1	0.887	73.660
	IdReg3	0.832	52.795		Remind2	0.911	118.120
	IdReg4	0.746	38.647		Remind3	0.915	118.187
Integrated Regulation	IngReg1	0.818	50.315		Remind4	0.910	111.337
	IngReg2	0.887	113.148	Rewards	Rewards1	0.931	130.175
	IngReg3	0.894	119.111		Rewards2	0.941	172.066
	IngReg4	0.850	67.871		Rewards3	0.935	140.809
Intrinsic Regulation	IntReg1	0.852	66.475		Rewards4	0.937	159.143
	IntReg2	0.908	120.280	Data Analysis	Analyze1	0.756	35.250
	IntReg3	0.922	147.234		Analyze2	0.771	39.391
	IntReg4	0.864	75.770		Analyze3	0.809	54.218
Social Data Sharing	Sharing1	0.911	112.122		Analyze4	0.797	50.604
	Sharing2	0.908	101.344		Analyze5	0.677	24.767
	Sharing3	0.877	77.880	Data Collection	Collect1	0.827	52.722
	Sharing4	0.910	116.294		Collect2	0.807	39.880
Social Encouragement	Encourage1	0.878	80.641		Collect3	0.791	41.066
	Encourage2	0.904	124.769		Collect4	0.841	65.058
	Encourage3	0.902	96.897	Data Updates	Updates1	0.709	26.035
	Encourage4	0.915	128.505		Updates2	0.681	24.448
Live Coaching	Coach1	0.935	125.135		Updates3	0.794	45.586
	Coach2	0.938	153.218		Updates4	0.795	50.254

Live Coaching	Coach3	0.937	144.606	Information Searching	Search1	0.895	72.747
	Coach4	0.940	170.583		Search2	0.875	63.403
					Search3	0.895	81.968
					Search4	0.912	116.501
				Vitality	Vitality1	0.881	94.025
					Vitality2	0.717	29.922
					Vitality3	0.884	101.583
					Vitality4	0.778	44.163
Vitality5	0.826	61.132					
Vitality6	0.873	71.204					

Discriminant Validity

To establish discriminant validity, the cross-loading matrix can be examined for troublesome cross-loadings between the indicators. Discriminant validity is confirmed if it can be illustrated that “measurement items posited to reflect (i.e., ‘make up’) that construct differ from those that are not believed to make up the construct” (Straub et al. 2004, p. 389). Loadings should be an order of magnitude greater than the nearest cross-loading (i.e., the difference between the primary loading and any other loading should be greater than 0.1) (Lowry and Gaskin 2014). This is the case for all of the items seen in Table C2 with the exception of encourage2, compare5, and compete1. However, these three items all load highest on their primary factor and cross-load with other first-order subconstructs of the same second-order construct where we might expect some correlation, so we retained these items and performed the second check for discriminant validity. For the second check, we examined the square root of the average variance extracted (AVE) for a construct in comparison to the construct correlations of that construct with every other first-order construct in the model. These results are shown in Table C3. The right portion of Table C3 contains the construct correlations. The bolded values that appear down the diagonal of the table are the square roots of the AVEs found in the second column for each construct. Any correlation below an bolded value should be lower than that bolded value (Fornell and Larcker 1981), which is the case for all of our constructs. Taken together, these results indicate discriminant validity.

Reliability

Reliability was examined using the AVE, composite reliability, and Cronbach’s alpha for each construct. These values were calculated by the PLS algorithm and provided as output. For our model, these values are provided in Table C3. Reliability scores are intended to provide an indication of how reliable the scales will be over time (Straub 1989). Ideally, the composite reliability should be above 0.7 (Hair et al. 2006) and greater than the AVE. Both are true for all constructs: all composite reliabilities are above 0.7 and the AVE is less than the composite reliability. It is recommended that the AVE be 0.5 or above (Fornell and Larcker 1981; Hair et al. 2006), which is the case for all of our constructs. Cronbach’s alphas above 0.7 are recommended and above 0.5 are acceptable (Davis 1964; Peterson 1994). The Cronbach’s alphas are above 0.7 for all of the constructs in our model. Thus, reliability was confirmed for all of the scales used in the study.

Multicollinearity

Multicollinearity refers to the situation where predictors are highly correlated with each other. To check for multicollinearity, the variance inflation factors (VIF) obtained from SmartPLS Version 3.2.1 can be examined. It is suggested that the VIF be below 10 (Hair et al. 2006; Neter et al. 1996). A VIF of greater than or equal to 5 has been suggested to be indicative of moderate multicollinearity and greater than or equal to 10 suggestive of severe multicollinearity (Larose and Larose 2015). VIF values for the items for this study are given in Table C4. All of the VIFs are below 10 and most are below 5, which suggest that multicollinearity is not an issue in our model.

Table C2. Cross-Loading Matrix

	Amot	ExtReg	InjReg	IdReg	IngReg	IntReg	Sharing	Encourage	Coach	Compare	Compete	Goal Mgmt	Remind	Rewards	Analyze	Collect	Updates	Search	Vitality
Amot1	0.886	0.628	0.105	-0.138	0.041	0.001	0.322	0.291	0.469	0.300	0.342	-0.069	0.206	0.314	-0.059	-0.218	0.007	0.112	0.076
Amot2	0.897	0.625	0.107	-0.113	0.077	0.013	0.391	0.359	0.536	0.347	0.390	-0.034	0.247	0.357	-0.048	-0.233	0.024	0.147	0.142
Amot3	0.906	0.604	0.099	-0.145	0.036	-0.038	0.324	0.297	0.448	0.294	0.345	-0.082	0.185	0.330	-0.094	-0.266	-0.045	0.088	0.063
Amot4	0.880	0.587	0.116	-0.127	0.020	-0.020	0.339	0.290	0.440	0.300	0.343	-0.076	0.185	0.326	-0.068	-0.245	-0.017	0.093	0.054
ExtReg1	0.591	0.874	0.199	-0.029	0.104	-0.008	0.386	0.358	0.427	0.348	0.394	0.009	0.223	0.368	0.040	-0.100	0.099	0.071	0.014
ExtReg2	0.585	0.883	0.221	0.019	0.147	0.067	0.416	0.413	0.468	0.386	0.407	0.052	0.290	0.373	0.039	-0.119	0.114	0.127	0.111
ExtReg3	0.648	0.860	0.242	0.026	0.166	0.084	0.398	0.366	0.471	0.361	0.389	0.012	0.277	0.388	0.022	-0.162	0.035	0.119	0.129
ExtReg4	0.542	0.842	0.243	-0.029	0.081	-0.011	0.361	0.339	0.403	0.339	0.355	0.051	0.228	0.351	0.017	-0.131	0.072	0.072	0.006
InjReg1	0.026	0.172	0.829	0.522	0.445	0.371	0.111	0.118	0.025	0.136	0.116	0.106	0.114	0.075	0.124	0.144	0.188	0.079	0.172
InjReg2	0.201	0.284	0.846	0.435	0.465	0.352	0.214	0.213	0.197	0.229	0.228	0.120	0.190	0.197	0.158	0.098	0.183	0.166	0.238
InjReg3	0.120	0.253	0.791	0.403	0.377	0.289	0.145	0.161	0.108	0.170	0.140	0.115	0.116	0.122	0.084	0.088	0.144	0.116	0.099
InjReg4	0.043	0.171	0.862	0.624	0.589	0.483	0.214	0.209	0.138	0.229	0.186	0.202	0.195	0.130	0.193	0.170	0.233	0.165	0.309
IdReg1	-0.151	0.001	0.492	0.859	0.698	0.619	0.112	0.123	0.045	0.109	0.069	0.227	0.120	0.024	0.170	0.233	0.196	0.204	0.415
IdReg2	-0.229	-0.096	0.406	0.788	0.550	0.558	0.039	0.038	-0.081	0.051	-0.001	0.252	0.050	-0.042	0.209	0.293	0.220	0.145	0.341
IdReg3	-0.220	-0.081	0.466	0.832	0.599	0.557	0.044	0.043	-0.055	0.032	-0.002	0.251	0.099	-0.036	0.213	0.317	0.255	0.171	0.356
IdReg4	0.109	0.152	0.581	0.746	0.660	0.629	0.165	0.165	0.158	0.191	0.154	0.130	0.147	0.132	0.144	0.160	0.171	0.190	0.407
IngReg1	-0.077	0.054	0.505	0.723	0.818	0.637	0.169	0.167	0.049	0.162	0.145	0.249	0.161	0.081	0.232	0.288	0.260	0.201	0.414
IngReg2	0.167	0.232	0.515	0.626	0.887	0.686	0.300	0.261	0.316	0.269	0.249	0.156	0.235	0.215	0.136	0.093	0.202	0.258	0.521
IngReg3	0.088	0.136	0.504	0.664	0.894	0.688	0.245	0.220	0.251	0.225	0.206	0.128	0.243	0.186	0.149	0.153	0.217	0.241	0.508
IngReg4	-0.033	0.062	0.479	0.700	0.850	0.667	0.181	0.184	0.107	0.181	0.124	0.168	0.140	0.091	0.205	0.260	0.241	0.216	0.459
IntReg1	0.050	0.072	0.392	0.581	0.643	0.852	0.183	0.154	0.140	0.171	0.139	0.128	0.158	0.123	0.188	0.190	0.179	0.170	0.472
IntReg2	-0.007	0.051	0.412	0.658	0.710	0.908	0.216	0.195	0.159	0.204	0.152	0.169	0.163	0.099	0.226	0.212	0.200	0.215	0.566
IntReg3	-0.001	0.042	0.407	0.675	0.715	0.922	0.213	0.183	0.171	0.197	0.148	0.186	0.178	0.097	0.218	0.224	0.224	0.232	0.547
IntReg4	-0.080	-0.019	0.433	0.691	0.685	0.864	0.134	0.116	0.084	0.133	0.071	0.231	0.130	0.046	0.203	0.257	0.202	0.212	0.508
Sharing1	0.338	0.398	0.208	0.119	0.246	0.200	0.911	0.786	0.522	0.781	0.743	0.185	0.310	0.472	0.219	0.023	0.257	0.250	0.250
Sharing2	0.338	0.398	0.203	0.115	0.246	0.206	0.908	0.793	0.510	0.772	0.719	0.173	0.294	0.475	0.191	-0.001	0.249	0.227	0.234
Sharing3	0.392	0.446	0.187	0.092	0.236	0.176	0.877	0.734	0.552	0.714	0.693	0.107	0.330	0.516	0.134	-0.067	0.211	0.238	0.235
Sharing4	0.333	0.392	0.182	0.086	0.223	0.180	0.910	0.789	0.507	0.759	0.703	0.170	0.295	0.467	0.178	-0.006	0.229	0.247	0.223
Encourage1	0.295	0.375	0.163	0.073	0.196	0.131	0.742	0.878	0.495	0.728	0.694	0.188	0.377	0.489	0.166	-0.016	0.272	0.256	0.191
Encourage2	0.335	0.410	0.235	0.122	0.272	0.200	0.820	0.904	0.550	0.775	0.744	0.204	0.347	0.488	0.186	-0.033	0.241	0.247	0.246
Encourage3	0.296	0.366	0.188	0.133	0.205	0.166	0.740	0.902	0.498	0.731	0.701	0.234	0.338	0.478	0.167	-0.040	0.259	0.250	0.228
Encourage4	0.329	0.388	0.201	0.096	0.202	0.163	0.793	0.915	0.521	0.772	0.727	0.217	0.334	0.495	0.182	-0.033	0.252	0.261	0.235
Coach1	0.522	0.505	0.131	0.008	0.205	0.128	0.533	0.529	0.935	0.486	0.492	0.081	0.403	0.544	0.044	-0.188	0.137	0.394	0.237
Coach2	0.484	0.469	0.150	0.026	0.191	0.141	0.553	0.548	0.938	0.516	0.502	0.094	0.395	0.528	0.071	-0.180	0.164	0.409	0.263
Coach3	0.492	0.464	0.152	0.043	0.215	0.167	0.543	0.545	0.937	0.496	0.495	0.113	0.415	0.519	0.084	-0.149	0.164	0.382	0.276
Coach4	0.504	0.486	0.139	0.022	0.209	0.154	0.543	0.531	0.940	0.494	0.495	0.091	0.426	0.520	0.068	-0.182	0.141	0.393	0.261
Compare1	0.322	0.378	0.223	0.099	0.227	0.183	0.780	0.756	0.468	0.915	0.792	0.178	0.283	0.489	0.191	-0.005	0.231	0.220	0.254
Compare2	0.326	0.380	0.210	0.097	0.209	0.159	0.772	0.767	0.481	0.914	0.783	0.167	0.271	0.456	0.176	-0.024	0.200	0.223	0.232
Compare3	0.331	0.399	0.234	0.120	0.238	0.192	0.771	0.766	0.490	0.916	0.802	0.199	0.259	0.492	0.183	-0.008	0.236	0.221	0.264
Compare4	0.279	0.355	0.211	0.116	0.222	0.183	0.724	0.749	0.493	0.887	0.776	0.225	0.335	0.470	0.228	0.043	0.268	0.215	0.280
Compare5	0.320	0.364	0.203	0.120	0.215	0.185	0.746	0.738	0.469	0.888	0.801	0.176	0.318	0.503	0.195	0.016	0.245	0.213	0.253
Compete1	0.383	0.418	0.180	0.060	0.186	0.116	0.738	0.739	0.477	0.828	0.918	0.172	0.292	0.506	0.140	-0.040	0.201	0.179	0.223
Compete2	0.350	0.402	0.191	0.069	0.197	0.133	0.741	0.756	0.490	0.803	0.932	0.177	0.300	0.492	0.133	-0.047	0.208	0.202	0.221
Compete3	0.363	0.415	0.195	0.055	0.188	0.141	0.734	0.733	0.503	0.823	0.937	0.175	0.298	0.530	0.129	-0.033	0.206	0.200	0.222
Compete4	0.389	0.428	0.218	0.084	0.224	0.148	0.733	0.733	0.497	0.796	0.930	0.170	0.308	0.553	0.134	-0.042	0.200	0.193	0.218
GoalMgmt1	-0.072	0.003	0.122	0.235	0.171	0.155	0.138	0.191	0.067	0.170	0.145	0.866	0.274	0.130	0.410	0.376	0.355	0.288	0.201
GoalMgmt2	-0.076	0.029	0.147	0.228	0.176	0.184	0.143	0.198	0.068	0.175	0.160	0.874	0.271	0.114	0.404	0.373	0.371	0.288	0.177
GoalMgmt3	-0.029	0.066	0.159	0.219	0.161	0.183	0.164	0.205	0.128	0.209	0.172	0.816	0.264	0.159	0.395	0.351	0.368	0.264	0.191
GoalMgmt4	-0.066	0.025	0.155	0.218	0.173	0.165	0.157	0.202	0.081	0.157	0.160	0.849	0.280	0.123	0.396	0.316	0.383	0.301	0.185
Remind1	0.196	0.240	0.186	0.122	0.181	0.152	0.293	0.333	0.354	0.265	0.273	0.299	0.887	0.236	0.190	0.047	0.374	0.263	0.188
Remind2	0.228	0.285	0.182	0.120	0.242	0.194	0.333	0.373	0.431	0.317	0.310	0.293	0.911	0.292	0.238	0.046	0.413	0.330	0.214
Remind3	0.218	0.300	0.173	0.119	0.200	0.148	0.320	0.368	0.408	0.306	0.304	0.288	0.915	0.292	0.211	0.051	0.400	0.300	0.214

Remind4	0.201	0.246	0.167	0.115	0.205	0.150	0.286	0.328	0.389	0.283	0.281	0.280	0.910	0.259	0.213	0.031	0.384	0.301	0.184
Rewards1	0.334	0.393	0.163	0.035	0.164	0.099	0.512	0.505	0.516	0.512	0.530	0.155	0.272	0.931	0.181	0.004	0.230	0.249	0.142
Rewards2	0.331	0.388	0.149	0.028	0.153	0.102	0.494	0.508	0.507	0.493	0.523	0.156	0.272	0.941	0.171	0.001	0.220	0.236	0.125
Rewards3	0.377	0.413	0.151	0.020	0.160	0.091	0.501	0.512	0.554	0.496	0.525	0.123	0.291	0.935	0.136	-0.046	0.190	0.265	0.140
Rewards4	0.354	0.411	0.152	0.021	0.164	0.093	0.495	0.503	0.530	0.495	0.520	0.145	0.282	0.937	0.154	-0.027	0.207	0.248	0.156
Analyze1	-0.083	0.017	0.187	0.219	0.192	0.209	0.138	0.143	0.015	0.141	0.092	0.407	0.165	0.105	0.756	0.574	0.458	0.160	0.234
Analyze2	-0.066	-0.008	0.097	0.164	0.148	0.176	0.140	0.111	0.057	0.153	0.078	0.328	0.205	0.116	0.771	0.504	0.508	0.218	0.174
Analyze3	-0.078	0.042	0.158	0.202	0.179	0.205	0.177	0.198	0.071	0.187	0.138	0.369	0.193	0.163	0.809	0.567	0.543	0.206	0.209
Analyze4	-0.012	0.059	0.154	0.145	0.168	0.167	0.169	0.162	0.104	0.185	0.124	0.380	0.209	0.147	0.797	0.511	0.494	0.197	0.169
Analyze5	-0.041	0.019	0.079	0.129	0.090	0.139	0.139	0.127	0.020	0.154	0.119	0.311	0.120	0.122	0.677	0.493	0.463	0.138	0.146
Collect1	-0.237	-0.139	0.121	0.264	0.208	0.219	0.000	-0.019	-0.149	0.023	-0.023	0.332	0.043	-0.037	0.599	0.827	0.481	0.114	0.190
Collect2	-0.223	-0.131	0.095	0.244	0.129	0.152	-0.024	-0.043	-0.165	-0.012	-0.046	0.356	0.034	-0.033	0.540	0.807	0.414	0.073	0.134
Collect3	-0.231	-0.132	0.123	0.246	0.173	0.205	-0.037	-0.044	-0.159	-0.028	-0.076	0.328	0.057	0.008	0.533	0.791	0.430	0.085	0.131
Collect4	-0.189	-0.084	0.162	0.249	0.212	0.233	0.015	-0.007	-0.138	0.028	-0.001	0.343	0.023	0.002	0.593	0.841	0.450	0.072	0.155
Updates1	0.079	0.172	0.179	0.167	0.219	0.164	0.263	0.285	0.232	0.242	0.224	0.297	0.477	0.232	0.399	0.278	0.709	0.232	0.181
Updates2	-0.061	0.004	0.155	0.150	0.105	0.105	0.127	0.134	0.034	0.131	0.112	0.317	0.180	0.123	0.463	0.435	0.681	0.124	0.061
Updates3	0.016	0.096	0.198	0.227	0.238	0.193	0.225	0.243	0.143	0.217	0.186	0.333	0.365	0.181	0.523	0.417	0.794	0.230	0.197
Updates4	-0.046	0.018	0.158	0.223	0.221	0.211	0.176	0.193	0.085	0.192	0.141	0.345	0.289	0.148	0.534	0.477	0.795	0.193	0.189
Search1	0.160	0.150	0.166	0.201	0.254	0.217	0.251	0.255	0.412	0.234	0.208	0.297	0.279	0.266	0.194	0.063	0.215	0.895	0.272
Search2	0.083	0.061	0.150	0.207	0.231	0.206	0.215	0.237	0.345	0.187	0.151	0.295	0.294	0.205	0.218	0.108	0.245	0.875	0.259
Search3	0.089	0.087	0.138	0.187	0.228	0.207	0.253	0.276	0.367	0.228	0.191	0.307	0.299	0.251	0.214	0.088	0.224	0.895	0.257
Search4	0.119	0.114	0.144	0.197	0.242	0.210	0.236	0.240	0.382	0.217	0.196	0.299	0.307	0.233	0.238	0.116	0.247	0.912	0.254
Vitality1	0.010	-0.007	0.209	0.446	0.487	0.534	0.167	0.147	0.161	0.197	0.148	0.169	0.125	0.069	0.199	0.213	0.153	0.215	0.881
Vitality3	0.239	0.193	0.267	0.282	0.397	0.443	0.302	0.298	0.317	0.321	0.281	0.150	0.233	0.215	0.193	0.062	0.163	0.248	0.717
Vitality4	0.047	0.037	0.209	0.428	0.493	0.503	0.227	0.223	0.235	0.255	0.222	0.209	0.194	0.116	0.234	0.185	0.200	0.273	0.884
Vitality5	0.007	0.036	0.242	0.439	0.481	0.486	0.176	0.162	0.167	0.169	0.133	0.226	0.193	0.107	0.228	0.183	0.209	0.235	0.778
Vitality6	0.112	0.105	0.191	0.343	0.410	0.435	0.222	0.210	0.266	0.241	0.207	0.157	0.198	0.138	0.172	0.130	0.153	0.213	0.826
Vitality7	0.085	0.048	0.215	0.401	0.475	0.530	0.213	0.213	0.241	0.236	0.201	0.187	0.166	0.117	0.189	0.148	0.178	0.259	0.873

Table C3. Construct Correlations, AVES, Composite Reliabilities, and Cronbach's Alphas

	AVE	C.R.	C.A.	Amot	ExtReg	InjReg	IdReg	IngReg	IntReg	Sharing	Encourage	Coach	Compare	Compete	Goal Mgmt	Remind	Rewards	Analyze	Collect	Updates	Search	Vitality
Amotivation	0.796	0.940	0.915	0.892																		
External Regulation	0.748	0.922	0.888	0.685	0.865																	
Introjected Regulation	0.693	0.900	0.856	0.120	0.262	0.832																
Identified Regulation	0.652	0.882	0.821	-0.146	-0.002	0.607	0.807															
Integrated Regulation	0.744	0.912	0.885	0.051	0.146	0.580	0.782	0.863														
Intrinsic Regulation	0.787	0.936	0.909	-0.011	0.041	0.463	0.735	0.777	0.887													
Social Data Sharing	0.813	0.946	0.923	0.388	0.452	0.217	0.115	0.264	0.212	0.902												
Social Encouragement	0.810	0.945	0.922	0.349	0.428	0.219	0.118	0.244	0.184	0.860	0.900											
Live Coaching	0.879	0.967	0.954	0.534	0.513	0.153	0.026	0.219	0.157	0.579	0.574	0.938										
Social Comparison	0.817	0.957	0.944	0.350	0.415	0.239	0.122	0.246	0.200	0.839	0.836	0.531	0.904									
Social Competition	0.863	0.962	0.947	0.399	0.448	0.211	0.072	0.214	0.145	0.793	0.797	0.529	0.875	0.929								
Goal Management	0.725	0.913	0.873	-0.072	0.036	0.171	0.265	0.200	0.202	0.177	0.234	0.101	0.209	0.187	0.851							
Reminders	0.821	0.948	0.927	0.233	0.296	0.195	0.131	0.229	0.178	0.340	0.387	0.437	0.324	0.322	0.320	0.906						
Rewards	0.876	0.966	0.953	0.373	0.428	0.164	0.028	0.171	0.103	0.535	0.542	0.563	0.533	0.560	0.155	0.298	0.936					
Data Analysis	0.583	0.874	0.820	-0.074	0.034	0.179	0.226	0.205	0.236	0.201	0.195	0.071	0.215	0.144	0.471	0.235	0.172	0.764				
Data Collection	0.667	0.889	0.833	-0.269	-0.148	0.154	0.308	0.222	0.249	-0.013	-0.034	-0.186	0.004	-0.043	0.416	0.048	-0.018	0.695	0.817			
Data Updates	0.557	0.833	0.733	-0.007	0.093	0.231	0.260	0.264	0.228	0.263	0.284	0.162	0.261	0.219	0.434	0.434	0.226	0.647	0.544	0.746		
Information Searching	0.800	0.941	0.916	0.125	0.115	0.167	0.222	0.267	0.235	0.267	0.282	0.421	0.242	0.208	0.335	0.330	0.266	0.242	0.106	0.261	0.894	
Vitality	0.687	0.929	0.907	0.097	0.079	0.267	0.473	0.554	0.591	0.261	0.250	0.277	0.284	0.238	0.222	0.221	0.151	0.245	0.188	0.213	0.291	0.829

Common Method Bias

Our study design incorporated recommendations to reduce common method bias following leading literature (MacKenzie et al. 2011; Podsakoff et al. 2003). The survey was implemented on the Qualtrics platform. The Qualtrics survey platform was used because it is an approved survey administration tool by the researchers’ institutional review board (IRB) and allows for data to be anonymously collected on the Amazon Mechanical Turk (mTurk) platform. The survey items were randomized within blocks based upon the Likert-scale response anchors for the items (e.g., strongly disagree to strongly agree). Providing anonymity to the survey respondents has been recommended as an approach to reduce common method bias (Podsakoff et al. 2003) by reducing the tendency of respondents to answer in a way that they think the researchers would prefer. Randomizing the survey items has also been suggested as a way to decrease common method bias (Podsakoff et al. 2003). “Attention trap” items were inserted throughout the survey. Attention trap items ask the respondent to select a particular response from the Likert-scale responses (Oppenheimer et al. 2009). For example, the respondent may be asked to “Please answer ‘Agree’ to this question.” The purpose of the trap items is to identify those respondents that are not cognitively engaged in responding to the survey and to discard those responses.

In addition, the construct correlation matrix can be examined to determine if any constructs are correlated above 0.90, which could indicate a common method bias issue (Pavlou et al. 2007). An examination of the construct correlations in Table C3 reveals that none of our constructs are correlated above 0.90. Harmon’s single-factor test (Lowry and Gaskin 2014; Podsakoff et al. 2003) was also employed to check for common method bias. We examined the unrotated factor solution in SPSS for all the items of our first-order constructs. The factor analysis revealed 12 distinct factors with the largest factor accounting for only 26.109% of the variance. This further suggests a lack of common method bias (Lowry and Gaskin 2014).

Table C4. Variance Inflation Factors						
Construct	Item	VIF	Construct	Item	VIF	
Nonregulation	Amot1	2.790	Social Comparison	Compare1	4.465	
	Amot2	2.722		Compare2	4.295	
	Amot3	3.328		Compare3	4.591	
	Amot4	2.774		Compare4	3.474	
External Regulation	ExtReg1	2.490		Social Competition	Compare5	3.698
	ExtReg2	2.206	Compete1		4.380	
	ExtReg3	2.150	Compete2		4.736	
	ExtReg4	2.530	Compete3		5.034	
Introjected Regulation	InjReg1	1.899	Goal Management		Compete4	4.613
	InjReg2	1.935		GoalMgmt1	2.340	
	InjReg3	1.900		GoalMgmt2	2.498	
	InjReg4	2.177		GoalMgmt3	1.869	
Identified Regulation	IdReg1	2.108		Goal Management	GoalMgmt4	2.201
	IdReg2	1.752	Reminders		Remind1	2.845
	IdReg3	2.056			Remind2	3.461
	IdReg4	1.426			Remind3	3.588
Integrated Regulation	IngReg1	2.873			Rewards	Remind4
	IngReg2	3.027	Rewards1	4.581		
	IngReg3	2.270	Rewards2	5.197		
	IngReg4	2.009	Rewards3	4.769		
Intrinsic Regulation	IntReg1	3.164	Data Analysis	Rewards4		4.792
	IntReg2	3.617		Analyze1	1.786	
	IntReg3	2.355		Analyze2	1.779	
	IntReg4	2.448		Analyze3	2.008	
Social Data Sharing	Sharing1	3.896		Data Collection	Analyze4	1.874
	Sharing2	3.867	Analyze5		1.517	
	Sharing3	2.995	Collect1		2.040	
	Sharing4	3.835	Collect2		1.863	
Social Encouragement	Encourage1	2.980	Data Updates		Collect3	1.811
	Encourage2	4.044		Collect4	2.133	
	Encourage3	3.325		Updates1	1.441	
	Encourage4	4.003		Updates2	1.420	
Live Coaching	Coach1	4.738		Information Searching	Updates3	1.684
	Coach2	4.967	Updates4		1.677	
	Coach3	5.136	Search1		3.046	
	Coach4	5.113	Search2		2.587	
			Vitality		Search3	3.001
				Search4	3.301	
				Vitality1	3.081	
				Vitality2	1.586	
			Vitality3	3.204		
			Vitality4	1.887		
			Vitality5	2.378		
			Vitality6	3.087		

Power

With a sample size of 880 and a probability level of 0.05, using the *post hoc* statistical power calculator for multiple regression (<http://www.danielsoper.com/statcalc/calculator.aspx?id=9>) our power is sufficient for each of our endogenous variables (i.e., > 0.80).

Appendix D

Path Coefficients for Second-Order Formative Constructs

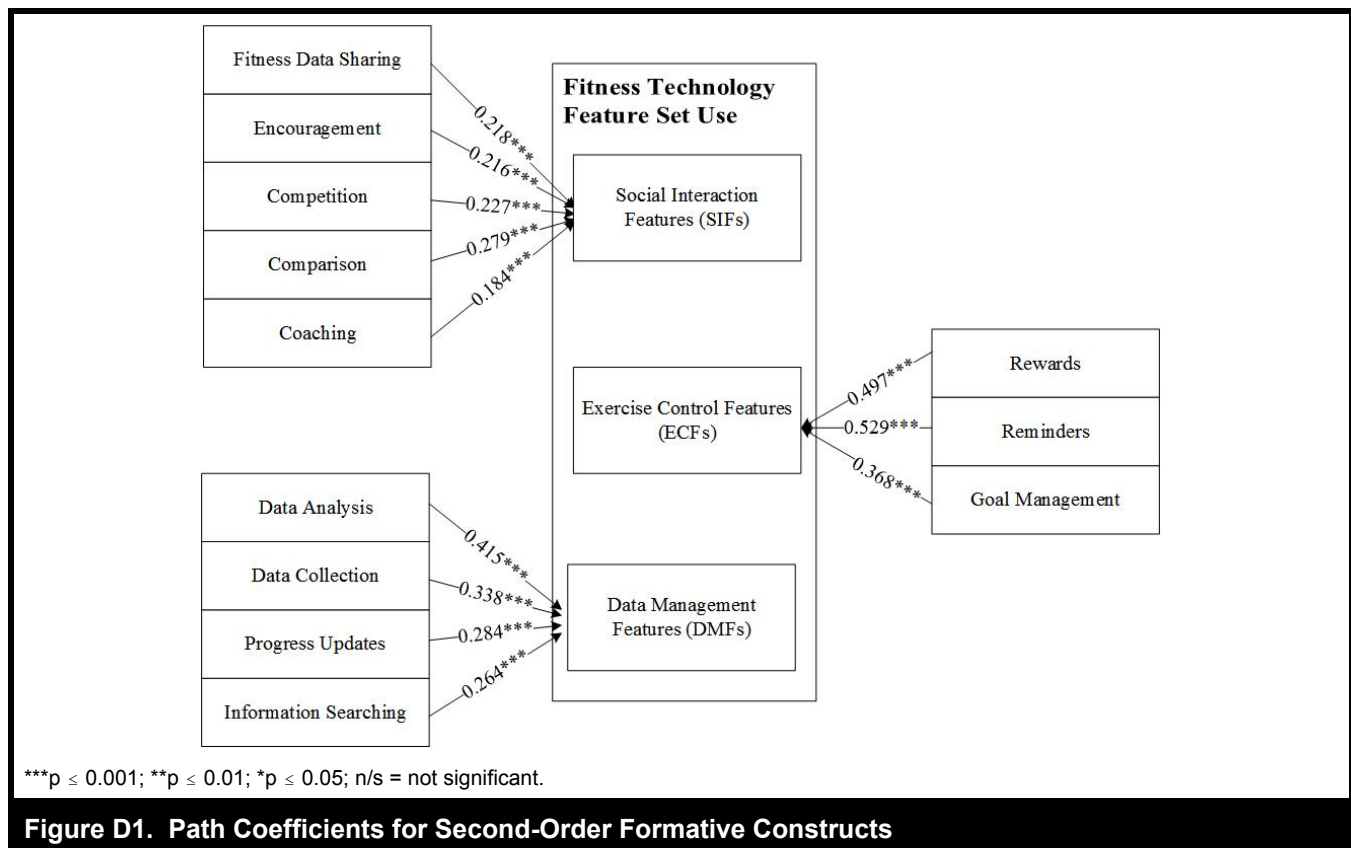


Figure D1. Path Coefficients for Second-Order Formative Constructs

Appendix E

Additional Moderation Testing

Table E1. Bootstrapped CI Tests for Moderation				
Interaction	2.5% lower bound	97.5% upper bound	Zero included?	Support?
Moderation of Exercise Motivations → Social Interaction Features by Controls				
Nonregulation × Age → Social Interaction Features	0.0033	-0.0217	Yes	No
External Regulation × Age → Social Interaction Features	0.0110	-0.0178	Yes	No
Identified Regulation × Age → Social Interaction Features	0.0081	-0.0080	Yes	No
Integrated Regulation × Age → Social Interaction Features	0.0090	-0.0101	Yes	No
Intrinsic Regulation × Age → Social Interaction Features	0.0077	-0.0064	Yes	No
Non-Regulation × Device/App Proficiency → Social Interaction Features	0.0473	0.0110	No	Yes
External Regulation × Device/App Proficiency → Social Interaction Features	0.0668	0.0228	No	Yes
Identified Regulation × Device/App Proficiency → Social Interaction Features	-0.0034	-0.0364	No	Yes
Integrated Regulation × Device/App Proficiency → Social Interaction Features	0.0415	0.0066	No	Yes
Intrinsic Regulation × Device/App Proficiency → Social Interaction Features	0.0329	0.0010	No	Yes
Non-Regulation × Frequency of Use → Social Interaction Features	-0.0031	-0.0273	No	Yes
External Regulation × Frequency of Use → Social Interaction Features	-0.0052	-0.0431	No	Yes
Identified Regulation × Frequency of Use → Social Interaction Features	0.0223	0.0008	No	Yes
Integrated Regulation × Frequency of Use → Social Interaction Features	-0.0015	-0.0264	No	Yes
Intrinsic Regulation × Frequency of Use → Social Interaction Features	-0.0001	-0.0110	No	Yes
Non-Regulation × Length of Ownership → Social Interaction Features	0.0207	-0.0030	Yes	No
External Regulation × Length of Ownership → Social Interaction Features	0.0349	-0.0045	Yes	No
Identified Regulation × Length of Ownership → Social Interaction Features	0.0018	-0.0168	Yes	No
Integrated Regulation × Length of Ownership → Social Interaction Features	0.0205	-0.0024	Yes	No
Intrinsic Regulation × Length of Ownership → Social Interaction Features	0.0140	-0.0020	Yes	No
Moderation of Exercise Motivations → Exercise Control Features by Controls				
External Regulation × Age → Exercise Control Features	-0.0003	-0.0433	No	Yes
Integrated Regulation × Age → Exercise Control Features	0.0061	-0.0314	Yes	No
External Regulation × Device/App Proficiency → Exercise Control Features	0.0397	-0.0037	Yes	No
Integrated Regulation × Device/App Proficiency → Exercise Control Features	0.0255	-0.0023	Yes	No
External Regulation × Frequency of Use → Exercise Control Features	-0.0187	-0.0628	No	Yes
Integrated Regulation × Frequency of Use → Exercise Control Features	-0.0061	-0.0433	No	Yes
External Regulation × Length of Ownership → Exercise Control Features	0.0332	-0.0045	Yes	No
Integrated Regulation × Length of Ownership → Exercise Control Features	0.0213	-0.0025	Yes	No
Moderation of Exercise Motivations → Data Management Features by Controls				
Non-Regulation × Age → Data Management Features	0.0329	0.0010	No	Yes
Identified Regulation × Age → Data Management Features	0.0369	0.0061	No	Yes
Non-Regulation × Device/App Proficiency → Data Management Features	-0.0057	-0.0358	No	Yes
Identified Regulation × Device/App Proficiency → Data Management Features	0.0404	0.0002	No	Yes
Non-Regulation × Frequency of Use → Data Management Features	0.0324	0.0040	No	Yes
Identified Regulation × Frequency of Use → Data Management Features	-0.00004	-0.0356	No	Yes
Non-Regulation × Length of Ownership → Data Management Features	0.0018	-0.0173	Yes	No
Identified Regulation × Length of Ownership → Data Management Features	0.0196	-0.0025	Yes	No

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