Affectivity Profiling in Relation to Exercise: Six-months Exercise Frequency, Motivation, and Basic Psychological Needs Fulfilment

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Abstract

Background: In the past 10 years, several studies using the affective profiles model (i.e., combinations of high/low positive/negative affect) show that individuals with high positive affect profiles (i.e., self-fulfilling and high affective) report greater propensity to exercise compared to individuals with low positive affect profiles (i.e., self-destructive and low affective). Nevertheless, these studies have not used objective measures of exercise frequency.

Objective: We investigated differences in exercise frequency six months back in time, motivation, basic psychological needs fulfillment, and if the effect of motivation and needs on training frequency was moderated by type of profile.

Method: 143 individuals at a training facility in the South of Sweden responded to the Positive Affect Negative Affect Schedule, the Behavioral Regulation in Exercise Questionnaire 2, the Basic Psychological Needs in Exercise Scale, and provided their membership number for the electronic tracking of their training frequency.

Results: Although there were no differences in exercise frequency, positive affect was negatively associated to external regulation and positively to autonomy, competence, and relatedness per se; both when negative affect was low or high. All other variables presented complex dynamic associations to affectivity. Training frequency was positively related to introjected regulation and competence among individuals with a self-destructive profile and negatively to relatedness among those with a high affective profile.

Conclusion: Future studies are needed in order to investigate objective measures of exercise frequency in relation to affectivity profiling. Importantly, the model allows the comparison of people who differ in one affectivity dimensions while keeping the other constant.

Keywords: Affective profiles model; Exercise motivation; Negative affect; Positive affect; Psychological needs; Training frequency

Introduction

The notion of the affective profiles model, coined by Archer and colleagues [1-4], suggests four possible profiles using combinations of individuals' experience of high/low positive/negative affect: (1) self-fulfilling (i.e., high positive affect/low negative affect), (2) low affective (i.e., low positive affect/low negative affect), (3) high affective (i.e., high positive affect/high negative affect), and (4) self-destructive (i.e., low positive affect/high negative affect). During the last 10 years, this model of the affective system has been used to distinguish individual differences in positive (i.e., well-being) and negative (i.e., ill-being) biopsychosocial health [5-12]. Mainly, compared to individuals with a self-destructive profile, individuals with a self-fulfilling profile, experience higher subjective (i.e., satisfaction with life, harmony in life) and psychological well-being (e.g., self-acceptance, personal growth, purpose in life, autonomy). In addition, individuals with a self-fulfilling profile also experience higher levels of energy, and optimism along lower levels of stress, depression, anxiety, maladaptive coping, and external locus of control [13-20].

The affective profiles model's greatest advantage, however, is that it can be used as a framework for within comparisons, that is, to compare individuals that are similar in one of the two affectivity dimensions but differ in the other dimension [21]. For example, when individuals who experience similar levels of low positive affect but differ in their experience of negative affect (i.e., low affective vs. self-destructive) are compared to each other, researchers have found that high levels of life satisfaction are associated to decreases in negative affect as long as positive affect is low. In essence, the affective profiles model offers a person-centered representation of the affectivity system—a 2×2 model that is diametrically different than the notion of seeing positive affect and negative affect as either bidimensional or as unidimensional. A large number of studies during the past 10 years show that one of the most recurrent results is that individuals with high positive affect profiles (i.e., self-fulfilling and high affective) report greater propensity to exercise than individuals with low positive affect profiles (i.e., low affective and self-destructive). Nevertheless, all these past studies have used self-reports for the measurement of exercise frequency. This might present a problem because self-reported answers might, for example, be exaggerated, influenced by social desirability bias, rely on individuals

memory, be inherently biased by the person's feelings at the time they filled out the questionnaire.

In the present study we had three aims. The first one was to replicate earlier findings showing differences in exercise frequency between individuals with distinct affective profiles. However, in contrast to all earlier studies, rather than self-reports, we used an objective measure of exercise frequency (i.e., training frequency measured electronically during the past six months). The second aim was twofold: to investigate differences between individuals with distinct affective profiles with respect to what motivates them to exercise (i.e., a motivation, external regulation, introjected regulation, identified regulation, and intrinsic regulation) and with respect to which basic psychological needs (i.e., autonomy, competence, and relatedness) are being fulfilled through their exercise regime. These aspects of exercise habits (i.e., exercise motivation and basic psychological needs fulfillment) have not being investigated before in relation to individuals' affective profiles. Moreover, also in contrast to earlier studies, we analyzed these differences by focusing on matched comparisons. That is, we investigated differences in, exercise frequency, exercise motivation, and basic psychological needs fulfillment between individuals who were similar in their experience in one affective dimension, but that differed in the other. In this way, we were able to examine what changes could be expected in relation to individual experience of one affectivity dimension while keeping the other constant: self-destructive vs. high affective (matching: high-high negative affect, differing: low-high positive affect), self-destructive vs. low affective (matching: low-low positive affect, differing: high-low negative affect), high affective vs. self-fulfilling (matching: high-high positive affect, differing: high-low negative affect), and low affective vs. self-fulfilling (matching: low-low negative affect, differing: low-high positive affect). As a further addition to earlier research, our third and final aim was to investigate if the effect of motivational dimensions and basic needs fulfillment on exercise frequency during the past six months was moderated by the individuals' type of affective profile.

Method

Ethical statement

The study was at first planned as part of a student thesis and the data on exercise frequency is a normal type of data gathered at the training facility. The Network for Empowerment and Well-Being's Review Board recommended that the present study required only informed consent from the participants.

Participants

A total of 158 individuals were recruited from a training facility in the South of Sweden. The final sample consisted of 143 (42 males, 101 females) participants with an age mean of 39.22 (sd = 22.99) who answered all the questions (i.e., a dropout rate of 6.96%). Besides responding to a battery of self-reports, all participants were asked to provide their gym membership number in order to track their training frequency six months before the study. Participants were informed that their participation was voluntary and confidential.

Measures

Exercise frequency: The number of times each participant was at the training facility for the last six months was recorded by an electronic entry system. This information was linked to the participants' gym membership number.

Affectivity: The Positive Affect and Negative Affect Schedule [22] requires participants to rate to what extent (1 = very slightly, 5 = extremely) during the last few weeks they experienced 10 positive (e.g., strong, proud, interested; Cronbach's α = 0.84) and 10 negative (e.g., afraid, ashamed, nervous; Cronbach's α = 0.84) affective states. The version here has been used in several previous studies among Swedes [23].

Motivation to exercise: The Behavioral Regulation in Exercise Questionnaire 2 [24,25] comprises five subscales (0 = not true for me, 4 = very true for me) assessing amotivation (e.g., "I think that exercising is a waste of time"), external regulation (e.g., "I exercise because other people say I should"), introjected regulation (e.g., "I feel guilty when I don't exercise"), identified regulation (e.g., "I value the benefits of exercise"), and intrinsic regulation (e.g., "I exercise because it's fun"). The instrument was translated and then back translated by native speakers for this specific study. No discrepancies were found between the Swedish and the English versions. Cronbach's α in the present study were .65 for amotivation, 0.78 for external regulation, 0.78 for introjected regulation, 0.70 identified regulation, and 0.90 for intrinsic regulation.

Basic psychological needs fulfillment by exercise: The Basic Psychological Needs in Exercise Scale [26] is based on Self-determination Theory [27] and designed to assess perceptions of the extent to which (1 = totally disagree, 5 = very strongly agree) a person experiences autonomy (e.g., "The exercise program I follow is highly compatible with my choices and interests"), competence (e.g., "I feel I have been making a huge progress with respect to the end result I pursue"), and relatedness (e.g., "I feel extremely comfortable when with the other exercise participants") in relation to their exercise habits. The instrument was translated and then back translated by native speakers for this specific study, no discrepancies were found between the Swedish and the English versions. Cronbach's α in the present study were 0.79 for autonomy, 0.80 for competence, and 0.84 for relatedness.

Statistical procedure

We divided participants' self-reported positive affect and negative affect scores into high and low using the median as reference point. This high/low categorization was then combined to group participants in one of the four affective profiles: self-destructive (low positive and high negative affect; n = 35), low affective (low positive and low negative affect; n = 41), high affective (high positive and high negative affect; n = 40), and self-fulfilling (high positive and low negative affect; n = 29). Garcia et al. [23] have found the median split method (i.e., variable-oriented method) to be relatively similar to cluster analyses methods (i.e., person-centered approach) for the affectivity profiling of individuals. Thus, we found the median split method as appropriate in the present study. See Table 1 for mean and standard deviations in all variables for each profile and the whole sample.

For the first and second aim we conducted planned matched t-test for the investigation of differences in exercise frequency six months back in time, exercise motivation, and basic psychological needs fulfillment between individuals with distinct profiles. For the third aim, we conducted four correlation analyses, one for each profile, to investigate if the effect of both exercise motivation and psychological needs fulfillment (predictors) on individuals' training frequency six months back in time (outcome) was moderated by the individuals' type of affective profiles (moderator).

		Self-destructive (n = 33)	Low Affective (n = 41)	High Affective (n = 40)	Self-fulfilling (n = 29)	Total (N = 143)
	Exercise Frequency for the past six months	33.46±43.38	27.33±22.58	37.33±28.04	29.24±22.37	31.98±30.31
MOTIVATION	Amotivation	1.23±0.42	1.12±0.35	1.15±0.33	1.22±0.52	1.18±0.40
	External Regulation	1.52±0.61	1.24±0.54	1.17±0.33	1.15±0.31	1.26±0.48
	Introjected Regulation	3.56±1.17	2.92±1.16	3.45±1.23	3.07±1.36	3.24±1.24
	Identified Regulation	4.77±0.91	4.58±1.00	5.07±0.77	5.06±0.70	4.86±0.88
	Intrinsic Regulation	4.86±1.08	4.90±1.06	5.31±0.63	5.41±0.56	5.11±0.90
NEEDS	Autonomy	3.46±0.79	3.71±0.74	3.93±0.77	4.10±0.69	3.80±0.77
	Competence	3.36±0.81	3.42±0.75	3.93±0.66	3.96±0.72	3.66±0.78
	Relatedness	3.48±0.92	3.59±0.84	3.87±0.74	4.08±0.78	3.75±0.84

Table 1: Means and standard deviations (±) in all variables for individuals with each distinctive profiles and the whole sample.

Results and Discussion

Differences between individuals in exercise frequency during the past six months

No differences were found between individuals at the extreme of the model (i.e., self-fulfilling vs. self-destructive, high affective vs. low affective). In addition, neither positive affect nor negative affect had a significant effect on participants exercise frequency during the past six months. Specifically, high positive affect was not associated with exercise frequency during the past six months when negative affect was low (self-fulfilling vs. low affective: t = -0.47, df = 62, p = 0.638) or high (high affective vs. self-destructive: t = 0.46, df = 72, p = 0.646). Also in this line, high negative affect was not associated with exercise frequency during the past six months when positive affect was low (self-destructive vs. low affective: t = -0.77, df = 72, p = 0.442) or high (high affective vs. self-fulfilling: t = 1.28, df = 66, p = .205). Nevertheless, one important observation was that both the individuals with a self-destructive (mean = 33.46) and those with a high affective profile (mean = 37.33) were the ones visiting the training facility at higher rate compared to individuals with a low affective (mean = 27.33) or those with a self-fulfilling profile (mean = 29.24). Indeed, earlier research shows that individuals with low levels of negative affect (i.e., low affective and self-fulfilling) live a more balanced and harmonious life. Interestingly, individuals with a high affective or a self-destructive profile have a Type-A personality [17], which is characterized by aggressiveness, hostility, competitive spirit, fast pace, impatience and a tendency to engage in two or several activities concurrently, to interrupt when other people are speaking, and suffer from being a workaholic are postulated to present a Type A-personality [28]. Obviously, explaining why individuals with a self-destructive or a high affective profile are more active visitors of the gym. Nevertheless, these differences were here not significant. See Table 1 for the details.

Differences between individuals in motivation to exercise

Individuals with a self-fulfilling profile scored lower in external regulation (t = 2.93, df = 60, p < 0.05) and higher in intrinsic regulation (t = 2.48, df = 60, p < 0.05) compared to individuals with a self-destructive profile. Individuals with a high affective profile scored also higher than to those with a low affective profile in introjected regulation (t = 2.00, df = 79, p < 0.05), identified regulation (t = 2.46, df = 79, p < 0.05) and intrinsic regulation (t = 2.08, df = 79, p < 0.05). In addition, positive affect was negatively associated to external regulation per se; both when negative affect was low (self-fulfilling vs. low affective) or high (high affective vs. self-destructive). Negative affect was positively associated to external regulation when positive affect was low (self-destructive

vs. low affective), but not when positive affect was high (high affective vs. self-fulfilling). Introjected regulation was positively associated to negative affect, but only when positive affect was low (self-destructive vs. low affective). Positive affect was positively related to intrinsic regulation per se; both when negative affect was low (self-fulfilling vs. low affective) or high (high affective vs. self-destructive) (Table 2).

Differences between individuals in basic psychological needs fulfillment by exercise habits

Individuals with a self-fulfilling profile scored higher in autonomy (t = 3.40, df = 61, p < 0.001), competence (t = 3.11, df = 61, p < 0.01), and relatedness (t = 2.77, df = 61, p < 0.01) compared to individuals with a self-destructive profile. Individuals with a high affective profile scored higher in competence (t = 3.26, df = 79, p < 0.01) compared to individuals with a low affective profile. In short, the comparisons of profiles at the extreme of the model suggests that individuals with a self-fulfilling profile experienced that their exercise program was of their own choice (i.e., autonomy), they were able to manage their training program (i.e., competence), and they felt comfortable with other people training at the same training facility (i.e., relatedness). In addition, positive affect was positively associated to autonomy, competence, and relatedness per se; both when negative affect was low (self-fulfilling vs. low affective) or high (high affective vs. self-destructive). Negative affect, on the other hand, was not related to any of the psychological needs (Table 3).

The relationship between exercise frequency, motivation, and basic psychological needs depending on individuals' type of affective profile

Correlation analyses showed that exercise frequency for the past six months was positively related to introjected regulation and identified regulation among individuals with a self-destructive profile and those with a high affective profile. These two motivation dimensions along intrinsic motivation were also positively related to exercise frequency for the past six months across the whole sample. In addition, external motivation was negatively related to exercise frequency in the whole sample. Nevertheless, no motivation dimension was associated to exercise frequency during the past six months for individuals with a low affective profile or for those with a self-fulfilling profile (Table 4).

With respect to basic psychological needs, correlation analyses showed that exercise frequency for the past six months was positively related to competence among individuals with a self-destructive profile. For individuals with a low affective profile, their training frequency was positively associated to both autonomy and competence. The

	Amotivation				External regulation				Introjected regulation				Identified regulation				Intrinsic regulation			
	t	*df*	*p*	*d*	*t*	*df*	*p*	*d*	*t*	*df*	*p*	*d*	*t*	*df*	*p*	*d*	*t*	*df*	*p*	*d*
Self-fulfilling (Pana) vs. Low Affective (pana)	-0.09	60	.929	0.02	**-2.93**	**60**	**.005**	**0.76**	-1.51	60	.136	0.39	1.41	60	.163	0.36	**2.48**	**60**	**.016**	**0.64**
High Affective (PANA) vs. Self-destructive (paNA)	-0.97	71	.336	0.23	**-3.09**	**71**	**.003**	**0.73**	-0.37	71	.711	0.09	1.54	71	.127	0.37	**2.19**	**71**	**.032**	**0.52**
Self-destructive (paNA) vs. Low Affective (pana)	1.27	72	.208	0.30	**2.07**	**72**	**.042**	**0.49**	**2.34**	**72**	**.022**	**0.55**	0.82	72	.413	0.19	-0.16	72	.877	0.04
High Affective (PANA) vs. Self-fulfilling (PAna)	-0.73	67	.471	0.18	0.28	67	.777	0.07	1.22	67	.228	0.30	0.05	67	.963	0.01	-0.73	67	.466	0.18

Table 2: Results of the matched t-test and the motivation variables. Note: PA = high positive affect; pa = low negative affect; NA = high negative affect; na low negative affect; *d* = *Cohen's d.*

	Autonomy				Competence				Relatedness			
	t	*df*	*p*	*d*	*t*	*df*	*p*	*d*	*t*	*df*	*p*	*d*
Self-fulfilling (Pana) vs. Low Affective (pana)	**3.40**	**61**	**.001**	**0.87**	**3.11**	**61**	**.003**	**0.80**	**2.77**	**61**	**.008**	**0.71**
High Affective (PANA) vs. Self-destructive (paNA)	**2.54**	**71**	**.013**	**0.60**	**3.36**	**71**	**.001**	**0.80**	1.98	71	.052	0.47
Self-destructive (paNA) vs. Low Affective (pana)	-1.42	72	.161	0.33	-0.36	72	.722	0.08	-0.52	72	.604	0.12
High Affective (PANA) vs. Self-fulfilling (PAna)	-0.98	68	.328	0.24	-0.16	68	.870	0.04	-1.17	68	.244	0.28

Table 3: Results of the matched t-test and the psychological needs variables. Note: PA = high positive affect; pa = low negative affect; NA = high negative affect; na low negative affect; *d* = *Cohen's d*. **Note:** bold type indicates significant differences

same basic needs were positively associated to individuals with a high affective profile and to the whole sample. However, training frequency for the past six months was not associated to any of the psychological needs among individuals with a self-fulfilling profile (Table 4).
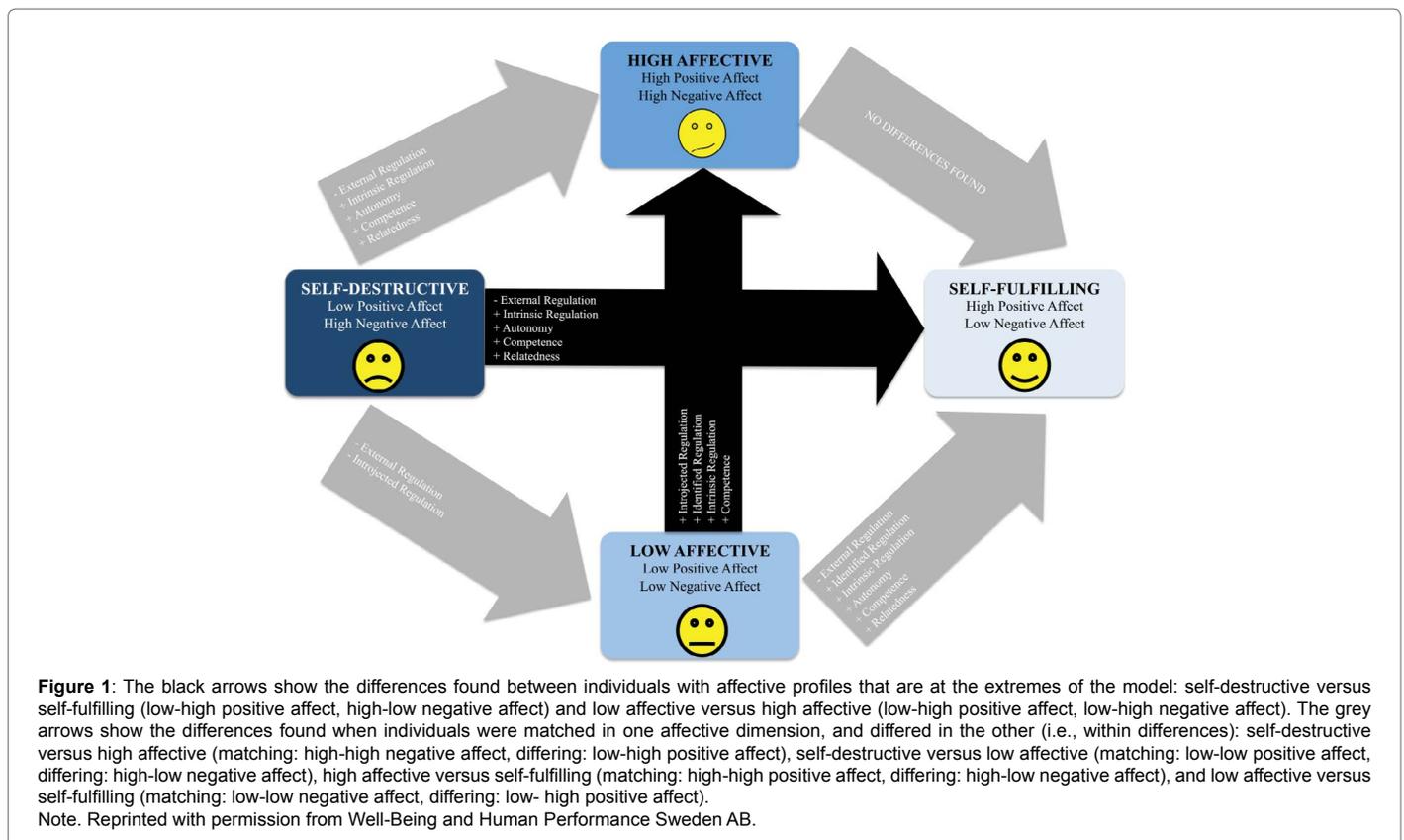
This study revealed differences in motivation and psychological needs depending on an individual's affective profile (Figure 1). By looking at the differences between individuals at the diametrical ends of the model, we first found that individuals with a self-fulfilling profile (i.e., high positive and low negative affect), compared to individuals with a self-destructive profile (i.e., low positive and high negative affect), scored low in external regulation and high in intrinsic regulation, autonomy, competence, and relatedness (see Figure 1, horizontal black arrows). This fits the description of a self-fulfilling profile as persistent, goal-directed, with high self-control and self-acceptance, resourceful, tolerant towards others, empathic, and helpful. In this line, at the other end of the diametrical comparisons, individuals with a high affective profile (high positive and high negative affect) scored higher in introjected regulation, identified regulation, intrinsic regulation, and competence than individuals with a low affective profile (low positive

and low negative affect). See Figure 1, vertical black arrows. At first sight, suggesting that profiles characterized by high levels of positive affect are "better off" than those profiles characterized by low levels of positive affect.

One of the strengths of the affective profiles model, however, is that it allows the comparison of people who differ in one of the two affectivity dimensions while keeping the other constant. In this way we get to observe associations within this complex dynamic adaptive system [29]. For example, it is true that decreases in feeling motivated to exercise through cohesions from the environment (e.g., external regulation: "I train because other people say I should") seem to always lead to high positive affect independently of negative affect being high (see grey arrows in Figure 1: self-destructive vs. high affective) or low in (Figure 1: low affective vs. self-fulfilling). In contrast, decreases in this very same motivational dimension (i.e., external regulation) lead to low negative affect only when positive affect is low (see grey arrows in Figure 1: self-destructive vs. low affective) not when positive affect is high (see grey arrows in Figure 1: high affective vs. self-fulfilling).

		Self-destructive	Low Affective	High Affective	Self-fulfilling	Total
MOTIVATION	Amotivation	-0.18	-0.22	0.04	-0.30	-0.16
	External Regulation	-0.30	-0.24	0.11	-0.03	-0.19*
	Introjected Regulation	0.38*	-0.09	0.42**	-0.16	0.19*
	Identified Regulation	0.45*	0.22	0.47**	-0.10	0.34**
	Intrinsic Regulation	0.22	0.25	0.25	0.13	0.24**
NEEDS	Autonomy	0.34	0.34*	0.41*	0.04	0.31***
	Competence	0.38*	0.35*	0.40*	0.04	0.33***
	Relatedness	0.04	0.20	0.14	0.14	0.12

Table 4: *Pearson's* correlation coefficients (*r*) between exercise frequency during the past six months and both motivation to exercise and psychological needs fulfillment for individuals with distinct profiles and the whole sample. Controlled by gender. Note: * $p < 0.05$, ** $p < 0.01$, ** $p < 0.001$.

Figure 1: The black arrows show the differences found between individuals with affective profiles that are at the extremes of the model: self-destructive versus self-fulfilling (low-high positive affect, high-low negative affect) and low affective versus high affective (low-high positive affect, low-high negative affect). The grey arrows show the differences found when individuals were matched in one affective dimension, and differed in the other (i.e., within differences): self-destructive versus high affective (matching: high-high negative affect, differing: low-high positive affect), self-destructive versus low affective (matching: low-low positive affect, differing: high-low negative affect), high affective versus self-fulfilling (matching: high-high positive affect, differing: high-low negative affect), and low affective versus self-fulfilling (matching: low-low negative affect, differing: low- high positive affect).
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Conclusion and Final Remarks

Future studies are needed in order to further investigate objective measures of exercise frequency in relation to a person's affective profile. All the interactions detailed in Figure 1, give a picture of the complexity of the association of both exercise motivation dimensions and psychological needs fulfillment by exercise to a person's affectivity system—an adaptive complex dynamic system.

"General Systems Theory, a related modern concept [to holism], says that each variable in any system interacts with the other variables so thoroughly that cause and effect cannot be separated. A simple variable can be both cause and effect. Reality will not be still. And it cannot be taken apart! You cannot understand a cell, a rat, a brain structure, a family, a culture if you isolate it from its context. Relationship is everything."
Marilyn Ferguson

had no role in study design, data collection and analysis, decision to publish, or preparation of the manuscript.

Conflict of Interest

Dr. Danilo Garcia is the Director of the Blekinge Center of Competence, which is the Blekinge County Council's research and development unit. The Center works on innovations in public health and practice through interdisciplinary scientific research, person-centered methods, community projects, and the dissemination of knowledge in order to increase the quality of life of the habitants of the county of Blekinge, Sweden.

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