Chapter 4
Exercise Behavior Change Revisited: Affective-Reflective Theory

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Chapter Overview

Meta-analyses show that theory-based interventions to increase physical activity behavior yield small effect sizes. One possible reason for this is that theories of behavior change that have been favored in exercise psychology over the past decades have overemphasized the role of forethought and controlled rational reflection. In contrast, the importance of situated affective reactions that cannot always be "thought away" by the individual has been underestimated. The affective-reflective theory (ART) of physical inactivity and exercise is a new theory that addresses this imbalance. The ART assumes that exercise-related stimuli (e.g., the thought of additional physical effort or a friend's reminder to go running) are quickly and involuntarily "valuated" before any reflective thought. This automatic affective valuation manifests as a pleasant or unpleasant feeling, which comes inherently imbued with an approach or avoidance impulse. Depending on the self-control a person is willing and able to apply in a situation, more reflective consideration about a possible change in behavior may follow. Reflective consideration can counteract or strengthen the initial impulse and lead to an intention to change. In this chapter, we explain why the ART is a fundamentally novel and different theory of physical activity behavior change. In the process, readers will also gain insights into the mechanisms of scientific (r)evolutions.

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Facts First

To understand the need for a new theory of exercise and physical inactivity, it is first useful to critically appraise the theories of behavior change that have been used to study these behaviors in exercise psychology over the past three decades. First, we assess the results of intervention studies. Then we turn to the theories themselves (for more discussion on theories used to explain and change physical activity and exercise behavior, see Chapter 2, Rebar et al., 2021; and Chapter 5, Delli Paoli, 2021).

Intervention Studies

A few years ago, a meta-analysis[1] summarized and statistically re-evaluated the results of 82 randomized controlled trials[2] (RCTs) that tested the efficacy of theory-based interventions for increasing physical activity (PA) in adults (Gourlan et al., 2016). The authors of the meta-analysis identified five psychological theories on which interventions were based, either exclusively or in combination. Four of the five theories are summarized in Table 4.1 (for brevity, we have omitted protection motivation theory (PMT), which was used in only one RCT).

Table 4.1

Theories of Behavior Change Used in PA Intervention Studies

Theories	Synopsis of the theory
Social cognitive theory (SCT; Bandura, 1986)	By observing others, how they behave within a social context and which experiences they create, the individual learns about the consequences of new behaviors. *Outcome expectations*, *social-structural factors* (facilitators and impediments), and the belief that one is capable of executing the behavioral steps necessary to achieve a goal (*self-efficacy*) can lead to behavioral *goals* that are then pursued by the individual.
Theory of planned behavior (TPB; Ajzen, 1991)	Behavioral beliefs form an *attitude* towards a behavior, normative beliefs result in *subjective norms*, and control beliefs determine one's *perceived behavioral control* over perceived barriers. These three interdependent elements determine whether an *intention* to change behavior is formed, which, if strong enough, is theorized to influence behavior.

[1] A meta-analysis is a quantitative synthesis of past studies, integrating the results from (ideally, all) empirical studies on a given subject. One of the criticisms against meta-analyses is that they may aggregate results from both well conducted and poorly conducted studies (e.g., Borenstein et al. 2009).

[2] In RCTs, study participants are randomly assigned to at least one treatment group and a comparison or control group. An outcome variable under investigation (e.g., PA) is assessed before and after a treatment period (e.g., an activity-promotion program in the intervention group vs. a comparison treatment in the control group), to determine whether it changed to the same or a different extent across the different groups. If the study was conducted well and values of the outcome variable in the two groups are found to differ significantly, it is reasonable to conclude that any differential change was due to the treatment. Researchers consider RCTs to be the most powerful research design for investigating intervention effects (Bickman & Reich, 2015).

Table 4.1 (continued)

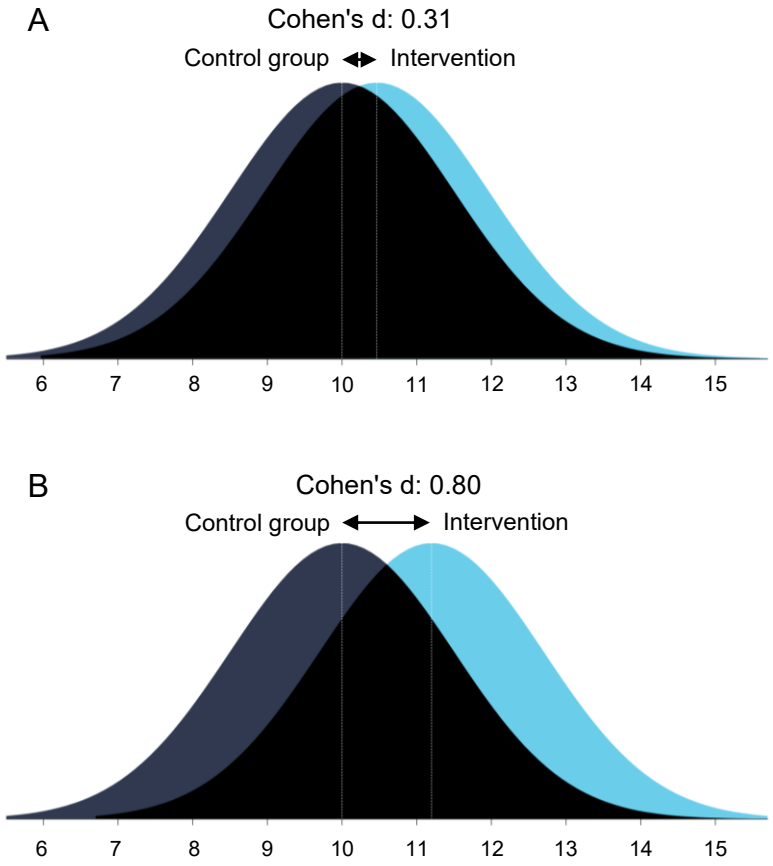
Self-determination theory (SDT; Deci & Ryan, 1985)	Self-determination theory consists of several mini-theories. Motivation is theorized to be most effective when it is intrinsic (i.e., when a behavior is performed for its own sake; *cognitive evaluation theory*). When behavior is externally regulated, it can still be increasingly aligned with oneself (*organismic integration theory*). If behavior is perceived as supporting the basic psychological needs for autonomy, competence, and relatedness, then well-being and general functioning are optimized (*basic psychological needs theory*). In addition, interindividual differences are assumed in people's tendencies to appreciate autonomy, to focus on outcomes (such as rewards, gains, and approval), and to worry about their competence (*causality orientations theory*). The SDT posits that pursuing extrinsic goals leads to less wellness than pursuing intrinsic goals (*goal contents theory*), and that close personal relationships are essential for adjustment and well-being (*relationships motivation theory*).
Transtheoretical model (TTM; Prochaska & DiClemente, 1982)	The TTM integrates the functional elements of diverse previous theories. According to it, most characteristically, behavior change can be regarded as proceeding across discrete stages of change, namely *precontemplation*, *contemplation*, *preparation*, *action, and maintenance* (*relapse* is sometimes included as an additional stage). The model defines *processes of change* that are useful for facilitating stage progression (e.g., *consciousness raising* from precontemplation to contemplation; *stimulus control* from action to maintenance). Stage progression is presumed to be accompanied by changes in subjective beliefs, e.g., the *pros* and *cons* of behavior change *(decisional balance*) and *self-efficacy*.

Note. According to Gourlan et al. (2016), 31 of the analyzed interventions referred to the TTM, 16 to SCT, 8 to TPB, 5 to SDT, only 1 to protection motivation theory (Rogers, 1983; not listed in the table), and 21 to combinations of these five theories.

The results of the meta-analysis (Gourlan et al., 2016) indicated a statistically significant difference in PA behavior (self-reported PA, device-measured PA, or a combination of both) in those who participated in a theory-based intervention (n = 10,574 individuals) compared to those who did not (n = 8,783 individuals). The effect size of this difference was quantified as falling in the range between d = 0.24 and d = 0.37 (95% confidence interval). This is typically characterized as a "small" to "medium" effect ($0.2 < d < 0.5$), according to convention (Cohen, 1988). Let's illustrate how small such an effect is.

Figure 4.1

Graphical Display of a Statistically Small (Part A) and a Large Effect Size (Part B)



Note. Standardized mean differences (*d*) are referred to as small (*d* = 0.20), medium (*d* = 0.50) and large (*d* = 0.80) effect sizes (Cohen, 1988). The *d* = 0.31 in Part A is taken from the results of the meta-analysis on the efficacy of theory-based PA interventions (Gourlan et al., 2016). For a more detailed explanation, see the body of the text. Source: https://rpsychologist.com/d3/cohend/ (Magnusson, 2020).

Figure 4.1, part A shows two overlapping distributions[3] with mean values differing by a "small" to "medium" effect size of *d* = 0.31 (i.e., the mean effect size for theory-based PA interventions, as identified by Gourlan et al., 2016).

The two distributions have 87.7% overlap, which gives a 58.7% chance that a study participant picked at random from the intervention group (the distribution presented in light blue) will have a higher score (e.g., PA level) than a person picked at random from the control group (i.e., "probability of superiority"). In other words, there isn't much more than a fifty-fifty chance (similar to a coin toss) that

[3] Statisticians like to think of measured values (e.g., exercise minutes per week) in samples of study participants as being distributed in such a way that extreme values are rare and mid-range values are much more frequent (as in a Gaussian "normal distribution").

the intervention will change behavior at the level of a single individual.[4] By comparison, Figure 4.1, part B illustrates two distributions that differ by a conventionally defined "large" effect size (i.e., standardized mean difference of *d* = 0.80). With a large effect, the probability of superiority increases to 71.4%.

In simpler terms, according to the results of the meta-analysis on the efficacy of theory-based PA interventions (Gourlan et al., 2016), if we randomly selected one of the 10,574 study participants who received a theory-based intervention, there is a less than 60% probability that this person would be more physically active than someone randomly selected from the 8,783 study participants who did not receive an intervention. Arguably, most exercise practitioners would consider this success rate to be discouragingly small for practical purposes.

Other interesting meta-analytic findings on the efficacy of theory-based PA interventions include the following. The success rates of interventions differed little, regardless of the theory that was used as their basis (Gourlan et al., 2016). Effect sizes are usually small across different meta-analyses (e.g., Compernolle et al., 2019; Grimmett et al., 2019; Ntoumanis et al., 2020; Romain et al. 2018). Moreover, there is evidence of publication bias[5] in this research field (Gourlan et al., 2016). Studies of lower methodological quality tend to produce larger effect sizes than the (rarer) high-quality studies (Bernard et al., 2017). A meta-analysis that included not only RCTs but also correlational studies reported slightly higher, but still small, effect sizes (McEwan et al., 2019); importantly, it also showed that theory-based interventions (148 studies, *d* = 0.48) and interventions not explicitly based on a theory (77 studies, *d* = 0.37) did not differ substantially in terms of their efficacy, as long as at least three behavior-change techniques were involved (e.g., social support, goals and planning, rewards and threats; Michie et al., 2013). Other meta-analyses have arrived at similar conclusions (e.g., Howlett et al., 2019; Rhodes et al., 2020).

In a Nutshell

Although authors of meta-analyses have concluded that PA interventions are effective (i.e., their efficacy, compared to control groups, is significantly different from zero), the practical meaningfulness of these results is questionable. A "small" effect is of limited practical relevance, especially when considering that effect sizes may be overestimated due to various methodological biases. Recent research has shown that basing an intervention on one of the theories discussed above does not meaningfully improve intervention effectiveness.

Explanation of Behavior (Theory Testing)

Numerous reviews on the theories of PA and exercise behavior change have been written, with almost identical conclusions (e.g., Buchan et al., 2012; Weinberg, 2018). One of the most recent review articles provided an historical and critical summary of individual theories and broad theoretical frameworks that have been used most frequently in exercise psychology over the past decades (Rhodes et al., 2019).

According to this review, SCT and TPB are important examples of the social cognitive framework (the TTM and PMT can also be classified within this broad theoretical framework). The reviewers

[4] We refer here to the so called "common language effect size" (McGraw & Wong, 1992) and its two basic assumptions: (a) that the distributions of the intervention and control groups will be normal, and (b) that the two distributions will have equal variances.

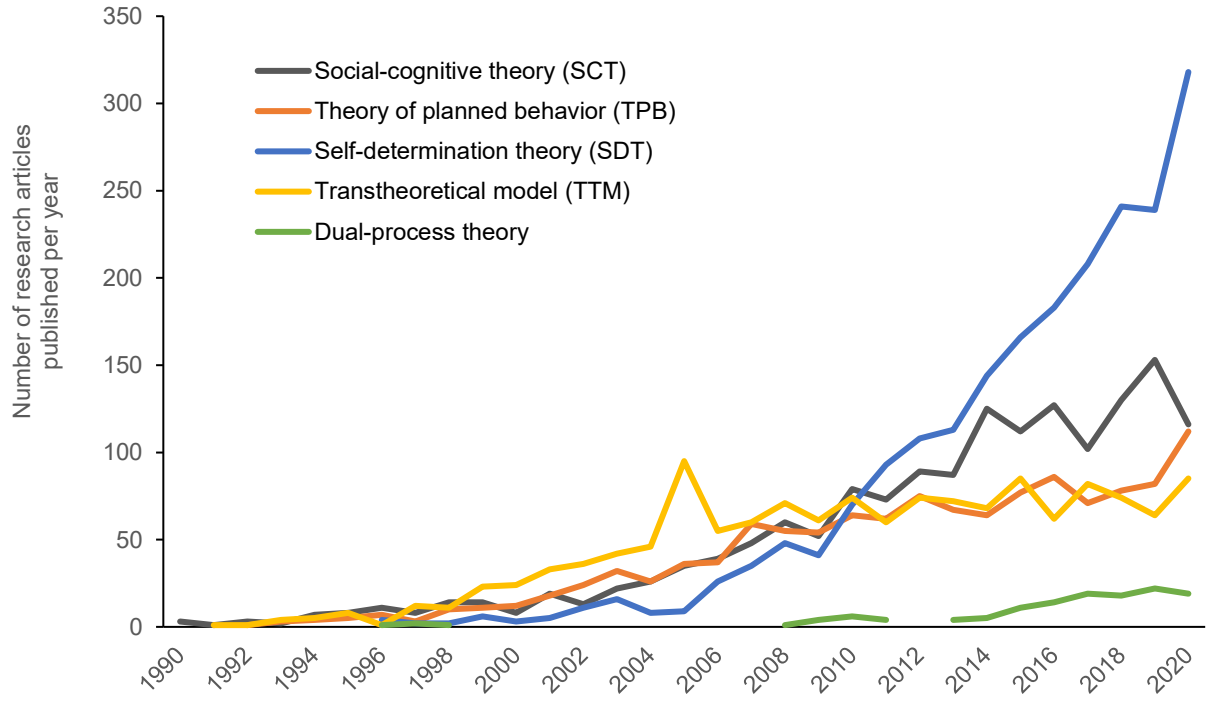
[5] Publication bias occurs when studies with statistically significant results are more likely to appear in the published literature, whereas studies with undesirable or nonsignificant findings tend to remain unpublished. This tendency leads to an overestimation of the apparent efficacy of interventions, including an overestimation of the efficacy of theory-based PA interventions in this case (Schäfer & Schwarz, 2019).

characterized it as "the dominant framework for understanding physical activity" (Rhodes et al., 2019, p. 100). Theories within this framework are characterized by two common assumptions, namely (a) that influences from the social environment shape our views and how we may behave, and (b) that people use their expectations about the future outcomes of their actions and inactions as a basis for directing their behavior. The SDT was highlighted by the reviewers as a theory from the humanistic/organismic framework that has seen "a surge in research in the last decade" (p. 100). This theory emphasizes a view of human beings that is about realizing potential, personal growth, and development. Rhodes et al. (2019) further referred to dual-process theories as "the most recent and understudied framework" (p. 100). According to theories classified under this framework, behavior is influenced by deliberate thinking on the one hand, and more automatic mental phenomena on the other (Evans & Stanovich, 2013).[6] Theories from this framework have not been used as the basis of interventions in exercise psychology so far.

That there are, in fact, only a handful of frequently used theories in exercise psychology can also be gleaned from a quick search in the Web of Science database.[7] Figure 4.2 illustrates how often the frameworks and theories have been cited in research publications over the past three decades (from 1990 to 2020). The large recent increase of interest in the SDT is obvious, and so is the even more recent interest in dual-process theories.

Figure 4.2

Growth in the Popularity of Theories of Behavior Change in Research Related to PA and Exercise



[6] In addition, there is the socioecological framework (Rhodes et al., 2019). Due to emphasizing mostly environmental and policy factors, this framework falls largely outside the psychological perspective discussed here.

[7] The Web of Science is a database whose scope is limited only to approximately 12,000 highest-quality scientific journals, according to the judgment of a selection committee.

Let us now examine the empirical support for these theories within exercise psychology by focusing on meta-analyses of (cross-sectional and prospective) correlational studies (rather than interventions). With regard to the TPB, it can be stated that *attitude* and *perceived behavioral control* account for roughly 30% of the variance in behavioral *intention* (with a modest and typically nonsignificant contribution of *subjective social norms*); *intention* is a significant predictor of *behavior* and has been estimated to account for approximately 20% of the variance in self-reported PA (Downs & Hausenblas, 2005). With the variables defined in the SCT (especially *self-efficacy* and *goals*), the portion of accounted variance in behavior reaches 31% (Young et al., 2014). From meta-analyses on SDT, it can be concluded that effect sizes are slightly higher. Results suggest that the correlation between self-determined motivation and PA behavior can range between r = .30 and r = .45 (Hagger & Chatzisarantis, 2009; Vasconcellos et al., 2020, for a more recent study on adaptive and maladaptive outcomes in physical education). Comparable correlations have been reported from the synthesis of study results based on predictions of the TTM. For example, later *stages of change* seem to be associated with higher levels of PA, changes in *self-efficacy* are moderately consistent with the TTM's predictions, stage progression from *contemplation* on is associated with small increases in perceived *pros* and large decreases in perceived *cons*, and behavioral *processes of change* peak from *precontemplation* to *contemplation* and from *preparation* to *action* (Marshall & Biddle, 2001). Meta-analyses on dual-process theories do not yet exist.[8]

Notice that, while in the earlier section that referred to meta-analyses quantifying the effect size associated with theory-based interventions compared to control, the effect size was Cohen's *d,* which represents the standardized mean difference in the outcome variable (e.g., PA) between the intervention and control groups. In contrast, in meta-analyses that examine relations between variables, the effect sizes used are the "percentage of accounted variance" (r^2) and the correlation coefficient (r). While keeping in mind that randomized controlled trials of interventions can be used to draw inferences about causation whereas correlational studies cannot, the different indices of effect size (d, percentage of accounted variance, and the correlation coefficient) can be converted to each other for comparison purposes. A conventionally large effect size of d = 0.80 can be considered analogous to 26% of accounted variance; correlation coefficients of r = .30 are characterized as medium, while those of r = .50 are described as large (Cohen, 1988). Thus, it seems that correlational empirical evidence obtained so far is consistent with the postulates of the various theories.

That said, there are again good reasons to look beyond statistics when trying to understand why these few theories have been preferred over others. First, it should be noted that a common thread among all of the above-mentioned meta-analyses is the generally poor methodologies of most of the included original studies; again, higher methodological quality is typically associated with lower effect sizes (e.g., Hagger & Chatzisarantis, 2009). Secondly, specifically regarding the meta-analyses summarizing the results of correlational studies, it is important to place these results in the context of a crucial methodological pitfall. When two variables are measured from the same source (e.g., only the respondents themselves), via the same response channel, such as questionnaires (e.g., attitude and intention, or autonomous motivation and behavior), at the same physical location, and at the same time (e.g., back-to-back, as part of the same battery of measures), their intercorrelations tend to be inflated by so-called "common method bias" (Armitage & Conner, 2001; Podsakoff et al., 2003). This means that part of the apparent intercorrelation between variables reflects not overlap between the constructs per se but rather the commonality of the measurement methods. Remarkably, despite this known source of bias, most exercise psychology studies measure not only psychological variables, but also PA and

[8] However, the association between automatic evaluations towards PA and PA behavior (i.e., the contribution of one of the two classes of processes postulated within dual-process theories) has been analyzed. Researchers have found a "small" effect size (Chevance et al., 2019).

exercise behavior using questionnaires. Thirdly, recent analysis shows that the medium and large effect sizes reported in many psychological studies must be evaluated with utmost caution when the studies in question were not preregistered (i.e., if the researchers did not detail their intended research aims, hypotheses, and methods prior to conducting their study, by entering this information in a published "protocol" paper, a public registry, or both). A recent analysis revealed that in preregistered psychological studies, effect sizes often appear greatly reduced or even halved (Schäfer & Schwarz, 2019). In exercise psychology, preregistration has been extremely rare until recently.

In a Nutshell

SDT and SCT are the most commonly used theories in studies that have attempted to predict or change PA and exercise behavior. The number of publications from studies conducted on the basis of these theories is still growing steadily. Results from these studies have been generally congruent for decades: the psychological variables postulated in these theories are correlated with PA and exercise with medium effect sizes (albeit with the caveat that these effect sizes may be inflated).

So, Where is the Problem?

The problem is that researchers in exercise psychology continue to focus on only a handful of theories, producing consistently similar results, although it is known from meta-analyses that these theories are of very limited practical value as the basis of behavior-change interventions. We believe that, half-a-century after the advent of the field of exercise psychology, it is counterproductive to gloss over this fact or to reframe PA interventions as being "effective" solely because they are significantly different from zero, and insist that they have the potential for meaningful long-term population-level changes in PA and health on a global scale (sentences to this effect can be found in *all* of the meta-analyses summarized here). This approach is counterproductive because, while accepting the current situation as the unavoidable status quo, the number of people who live with reduced quality of life, disability, and shortened lifespans due to physical inactivity continues to increase (Guthold et al., 2018).

The alternative approach we advocate is to fundamentally question the established theoretical foundations of exercise psychology. While providing part of the answer, the few popular theories clearly do not suffice to adequately explain the reasons for physical inactivity and behavior change. They offer only a partial answer regarding what needs to be done in practice to produce meaningful and sustained behavior change.

Ok, New Theories. Or Is that Difficult?

According to the philosopher of science Thomas Kuhn, the development of science can be described as a recurring sequence that unfolds from a phase of so-called *normal science* into a phase of *extraordinary science* (i.e., a novel conceptual or methodological approach, leading to new insights into the phenomena being investigated) into a phase of new normal science (Kuhn, 1962/1996). Times of normal science produce research "firmly based upon one or more past scientific achievements, achievements that some particular scientific community acknowledges for a time as supplying the foundation for its further practice" (p. 10). A *crisis* occurs when existing theories and scientific practices fail to solve the problems that have been defined by these theories and these scientific practices. When a growing number of scientists acknowledge that existing theories provide a poor fit to empirical observations, this marks the beginning of the transition from normal to extraordinary science. While scientific progress during normal phases is entirely possible and can result in evolutionary advances, crises and extraordinary phases can lead to leaps in knowledge that have been characterized as *scientific revolutions*. It is difficult to achieve this kind of progress, however, because one characteristic of normal science is that it tends to be highly resistant to change.

We claim that exercise psychology today is in a phase of normal science, with clear emerging signs of a crisis, both with regard to theories (Ekkekakis, 2017) and with regard to research practices (Caldwell et al., 2020). While change is afoot and the crisis is brewing, a *scientific revolution* in a Kuhnian sense is still at an early stage and gaining momentum.

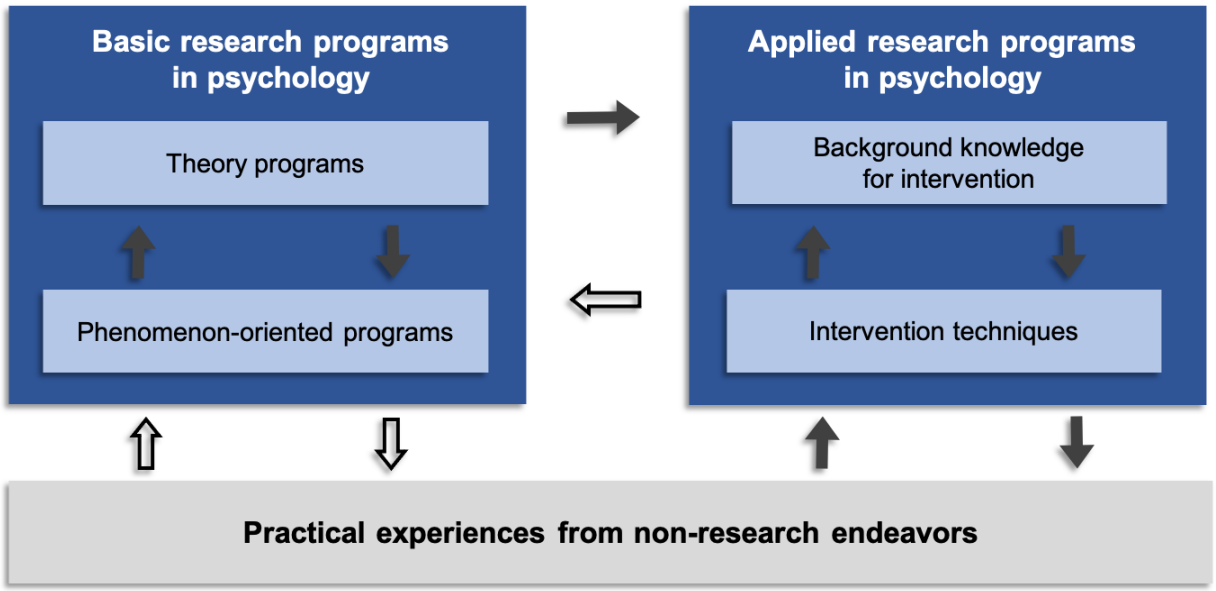
We have already explained in various texts that the continuing insistence on the social cognitive and the humanistic/organismic frameworks (see Figure 4.2) entails a limiting, narrow cognitivist perspective on PA and exercise behavior change (e.g., Brand & Cheval, 2019; Ekkekakis et al., 2019; Ekkekakis & Brand, 2021). In particular, we have argued that the contribution of affective processes has been trivialized or marginalized (e.g., Ekkekakis et al., 2018; Ekkekakis & Brand, 2019). These two points will be reiterated as part of our description of the affective-reflective theory (ART) later in this chapter. Before we do this, however, we will focus on two other points. First, we will highlight the common misconception that results from studies testing theories are directly useful for informing interventions. Second, we will point to a very unfavorable development in the practice of research as a reason why it is so difficult for theories outside of the current conceptual "mainstream" to appear on the research community's radar.

Research Programs and Types of Knowledge Generated

According to the epistemology of science, there are different ways of doing research (Bunge, 1983; Lakatos, 1978). Psychology was described as a discipline in research programs that can be characterized by how the psychologists involved would usually direct their research (Figure 4.3; Herrmann, 1994). Those interested in psychological *basic research programs* aim to explain, understand, and conceptualize reality as accurately as possible (e.g., decipher the mechanisms governing human thinking or motivation). Psychologists who involve themselves in *applied research programs* instead aim to provide practitioners with background knowledge about why things are the way they are, and how they may intervene to bring about positive change (e.g., treat a disorder or motivate people to be more physically active).

Figure 4.3

Research Programs and How They Relate to Each Other



Note. Black arrows represent greater impact.

Within basic research programs, theory programs can be distinguished from more phenomenon-oriented programs. *Theory programs* are aimed to test the validity of a theory. Researchers immersed in this kind of research tend to look for domains in which a defined explanation (theory) can be applied and tested. Researchers immersed in *phenomenon-oriented programs,* on the other hand, tend to follow research questions such as "What should a theory postulate in order to explain the problem of interest as thoroughly as possible?" Research of this kind focuses on phenomena for which there is presently no adequate theoretical explanation.

In applied research programs, studies are designed to yield a foundation for action. Where one type of applied program primarily aims to provide *background knowledge for interventions* ("What should you know to better understand what needs to be done in practice?"), another type, which can be described as *action programs,* tests the intervention techniques themselves ("In order to achieve the result 'x', do 'y' because that is more effective than doing 'z'"). Both forms of applied research can relate to theory, of course. But, unlike basic research, in both types of applied research, the explanation for why something works is less important than the feasibility and efficacy of the solution.

Now, why is it important to know about these distinctions? The reason is that knowledge generated from basic research programs that study the relationships between variables in theories is not sufficient for the scientific substantiation of interventions. This is the kind of knowledge that the vast majority of exercise psychology studies have accumulated thus far, however. What is now required is direct evidence from applied research programs consisting of studies that test the effectiveness of intervention techniques derived from variables defined in the theories.[9] Knowing that two variables are correlated or make a difference in reality does not automatically imply evidence about the means of changing these variables.

In a Nutshell

Although exercise psychology aims to be an applied research discipline, most of its empirical studies have been designed (perhaps unwittingly) as basic research aimed to test relations between variables, as defined in theories. The mantra-like assertion (which can be found in all meta-analyses cited earlier) that empirical evidence on the relations between theoretically defined concepts ensures that actions derived from them will be effective is, in fact, baseless. This is exactly what recent research from applied intervention programs shows. According to meta-analytic findings, whether one of the described mainstream theories is used as a basis makes no difference in the effectiveness of interventions (e.g., McEwan et al., 2019). Reasons that may, at least in part, explain why the handful of theories that have been found to be generally insufficient to achieve meaningful and sustained PA behavior change still dominate the research literature are described in the next section.

[9] The logical proof behind this claim may be more than what you need to know. Nevertheless, it is still cool to know it, and it can certainly impress your professor: Basic research programs and applied background knowledge programs aim to develop and test nomological statements of the form "if x, then y". For example, with regard to an evidence-based claim of SDT, if there is autonomous motivation (x), then there will be exercising (y). Nomological statements only hint at eventual actions and consequences. Actions have to meet additional conditions for the anticipated consequence to occur: actions must represent operationalizations (x*) of x, and actions x* must cause the effect y. Furthermore, y must be operationalized (y*). Nomopragmatic statements of the form "if x* is done, then y* occurs" are closer to application than nomological statements. However, a nomopragmatic statement never excludes the possibility that there are other actions with which y* can be achieved, in the same way or even better (e.g., "if x° is done, then y* occurs"). This means, that from "if x* is done, then y* occurs," it can only be concluded that "x* is one possible way of reaching y*." Empirical studies that examine nomological statements in no way provide the scientific evidence that interventions derived from them will be effective.

Publish or Perish

An increasing number of research articles are being published worldwide each year. Researchers have never before been under so much pressure to demonstrate and continuously prove their talent and performance through publications, with career preservation and advancement dependent upon it (Grimes et al., 2018). According to another quick search of the Web of Science database, the number of published articles per year worldwide first exceeded 1 million in 1991. In the year 2008, the 2 million mark was passed, and in 2016, there were 3 million published research articles per year. Exercise psychology has not escaped this trend. As depicted in Figure 4.2, the number of published articles on exercise and PA motivation has increased exponentially since about 2000. This may be related to the fact that the topic has become increasingly important over the past several years (precisely because of growing societal pressure to develop interventions to effectively promote PA and exercise; Guthold et al., 2018). Another possible reason is that the number of exercise psychologists in academia, who have to publish in order to promote their careers, has increased in a similar way. The problems emanating from this publish-or-perish culture are well described (e.g., Everett & Earp, 2015; Lilienfeld, 2017; Zou et al., 2018).

The remarkable increase in the volume of the research output in exercise psychology should not be interpreted as an indication that most studies are of low quality. Instead, we believe that there are now enough studies demonstrating that the correlations between variables defined in SCT, TPB, SDT, etc. are significantly different from zero, and that study participants with higher values do tend to exhibit more PA.

From our point of view, one reason why researchers have continued to conduct correlational studies in large numbers for too long is that doing intervention studies instead is expensive and time-consuming: intervention content must be defined (and manualized), then delivered by practitioners (researchers are generally trained for different things), and then the possible effects must be monitored over months and years (at least when it comes to providing evidence for sustained behavior change). How much easier (and more rational in terms of promoting one's career) is it to only ask study participants to complete some questionnaires or tests for a few minutes! Researchers are incentivized to do what "works," especially in times of normal science (see above).

In a Nutshell

The increasing number of studies supporting a handful of theories is probably due to the fact that researchers are required to publish a lot in order to meet the constantly increasing (and often outrageous) performance expectations of modern-day academia. It seems quite rational that, under these circumstances, researchers tend to focus on studies that are "quick and easy" to implement and produce articles that can be published just as quickly and easily thanks to the predictably positive results.

Interim Conclusion: Yes, It Is Difficult Indeed.

It is not easy to understand why the few theories of behavior change that are currently preferred in exercise psychology, despite meta-analyses having shown that they are of limited value as the basis of interventions, continue to be the focus of most studies. We interpret this as a sign of exercise psychology being in a state of Kuhnian crisis, perhaps approaching the farewell of a phase of normal science (Kuhn 1962/1996). Only in this way[10] can we rationalize why the same handful of theories continue to be emphasized in review articles and textbooks, leading to assertions that these few theories should be used as the foundation of public-health intervention programs. As we

[10] In addition, fundamental cognitive effects also contribute to the situation (e.g., confirmation bias, or the tendency to interpret new evidence as confirmation of one's existing theories or beliefs).

emphasized, such assertions disregard fundamental epistemological principles (recall that knowledge from theory testing in basic research programs cannot be assumed to entail that interventions would be effective).

In such times, with exercise psychology in crisis, it is not easy to convince researchers that it might be necessary to look beyond the well-known "successful" theories (in the paradoxical sense described above) and to seek new ones that offer a broader perspective. Nevertheless, here we present our alternative view. The affective-reflective theory (ART), published only a few years ago (Brand & Ekkekakis, 2018), is already receiving some attention according to citation numbers.[11]

Affective-Reflective Theory of Physical Inactivity and Exercise

Although we strongly believe in an evidence-based science, we also know that high-quality empirical research can only arise from solid theoretical groundwork (e.g., Borghi & Fini 2019; Toomela, 2010). Therefore, in this section of our chapter, we will focus on theory. We will present the affective-reflective theory (ART), without detailing all the empirical studies that led to its development. We will also summarize the nomological network and paradigmatic roots of the key components of the theory, again focusing only on their most essential features. More detailed descriptions are presented in other texts (Brand & Ekkekakis, 2018; Brand & Gutmann, 2020; Ekkekakis et al., 2020; Ekkekakis & Brand, 2021; Ekkekakis & Brand, 2019).

Fundamental Features

We will summarize three fundamental conceptual underpinnings of the ART: (a) core affect and automaticity, (b) dual-process theory, and (c) considerations about the phenomenological uniqueness of the exercise experience. For more discussion on core affect, see Chapter 12; Zenko & Ladwig, 2021).

Core Affect and Automaticity

Many ideas in the ART center around the concept of *core affect,* namely a neurophysiological state that is consciously accessible at any time as a simple nonreflective feeling (e.g., Ekkekakis, 2013). It can be subjectively described, operationalized, and measured in terms of two orthogonal and bipolar dimensions: *pleasure vs. displeasure* (affective valence) and *high arousal vs. low arousal* (Russel & Feldman Barrett, 1999). Core affect is a constant component of consciousness and can oscillate (becoming more pleasant or more unpleasant) in response to changes in the internal and external environment. Some of these pleasant and unpleasant oscillations may occur automatically, in the sense that they do not require an antecedent cognitive appraisal (e.g., the immediate displeasure associated with pain) and, in some cases, cannot be intentionally changed or controlled at the moment when they occur (Bargh, 1994).[12] While some degree of stimulus processing (no matter how fast or rudimentary) is always required, by definition, core affect is a conscious, lived experience. While core affect is always accessible to conscious awareness (e.g., if we deliberately turn our attention to how we feel at any moment) changes in core affect, provided that they are large enough, may also force a shift of attentional focus (e.g., the sudden shift of attention in response to a loud noise nearby).

[11] If researchers cite their colleagues' publications, this may imply that they considered material in these texts to be useful or valuable. Citations may reflect—with significant limitations—aspects of scientific impact and relevance. But there is no evidence that citations reflect other important dimensions of research quality (e.g., plausibility and soundness, scientific and societal value, originality; Aksnes et al., 2019).

[12] Reviewers concluded that many psychological processes must not be misconceived as being *either* automatic *or* controlled (Bargh, 1994). Instead, the extent to which the process is unintentional, occurs outside awareness, is uncontrollable and is efficient in its use of attentional resources, defines the degree to which it should be considered to be *more or less* automatic.

All the psychological theories highlighted in the first part of this chapter emphasize the importance of reflection and rationality in achieving behavior change. Possible effects of core affective states that occur automatically remained unconsidered (at best, their role was considered as being indirect, as in affective states biasing reflective cognition; see Table 4.1).

In a sense, the few cognitivist theories that have been considered in exercise psychology prescribe how the physically inactive individual should think about the behavior, in order for behavior change to be achieved. For example, these theories imply that practitioners should facilitate the development of positive outcome expectations (SCT and TTM). Individuals are supposed to gain confidence in their ability to succeed, even in the face of difficulties (SCT and TTM), learn that there are good reasons for a positive attitude toward the new behavior (TPB), or recognize and accept that the behavior can align with one's personal values and goals (SDT). So, from the perspective of these cognitivist theories, behavior change should follow naturally from rationally reflecting on the positive outcomes that may occur in the future.

The ART of physical inactivity and exercise is different. Here, the personal experiences with exercise the individual has had in the past are especially important. More precisely, the theory is about the core affective feelings (such as pleasure and displeasure) that the individual had experienced during previous episodes of exercise, which are automatically re-actualized (summarily, as a core affective state) in the moment individuals are presented with an opportunity to be physically active. This automatic core affective feeling is immediate and influences all further processes. It can color subsequent mental reflection, you can try to suppress it or let it carry you, and it can translate directly into a behavioral impulse. The ART is about affect that occurs automatically.

Dual-Process Theory and Core Affect

The dual-process framework is historically a brainchild of cognitive psychology. It is rooted in early experimental findings, which showed, for example, that the justifications declared by participants as reasons for their behavior in an experiment did not match their actual behavioral responses (Wason & Evans, 1975). This led to the psychological theory that there might be a duality of social information processing: one type that is independent of active deliberation, which would influence behavior primarily when the individual acts quickly and spontaneously, and a second type that directs behavior through active deliberation (e.g., Evans, 1989). According to more recent terminology, some authors assume fast and automatic processes that deliver a default response (so-called "Type-1" processes) and controlled higher-order reasoning processes (so called "Type-2" processes; Evans & Stanovich, 2013).

On the other hand, there is also a *unimodel* view (e.g., Kruglanski & Gigerenzer, 2011), according to which the nature of the task (e.g., behaving under imposed time pressure) and working memory capacity (e.g., if one is tired and unable to concentrate) determines the rules by which information is processed within one and the same cognitive system. Depending on these two factors (nature of the task and working memory capacity), information may be processed in more detail or mental shortcuts may be followed that ignore parts of the information. One of several proposed shortcuts is the *affect heuristic*. According to this idea, "representations of objects and events in people's minds are tagged to varying degrees with affect" (Slovic et al., 2002, p. 400). Instead of making the mental effort to deliberate (or when the information is too complicated or voluminous), it is often easier and faster to simply rely on the affective tags recalled by the situation: pleasant tags attract, appeal, or entice (approach tendency), whereas negative tags deter, repel, or repulse (avoidance tendency).

Although the ART focuses on affect and aspects of it might be sufficiently addressed in the unimodel view, it is a genuine dual-process theory. We will explain this with regard to the notion of a *conflict* between Type-1 and Type-2 processes inherent in the ART (see below for more on this point). In this context, it is critical to recognize that the ART, unlike other dual-process theories, fundamentally refers to the mental and somatic phenomena related to PA and exercise, and not only to the processes

of judgment and decision making in general.

The ART follows a line of theorizing introduced by early social psychologist Kurt Lewin, who contributed an idea that lost its prominence after the rise of cognitivism. His theory explained behavioral changes as a consequence of a disturbed equilibrium of *driving forces* and *restraining forces* in the psychological field of the individual (Lewin 1943, 1951). When possibilities for a behavioral shift emerge, forces can arise that drive you toward this shift. At the same time, other forces may hold you back, keeping you idle at your current state. This creates tension (i.e., conflict) that may continue until one of the two opposing forces prevails.

From the unimodel perspective, the notion of opposing forces is obsolete. It appears in rudimentary form in the social-cognitive construct of outcome expectations (Bandura, 1986) that implies a consideration of possible pros and cons of alternative behavioral options. However, it is most apparent in dual-process theories of social cognition, where the Type-1 and the Type-2 processes are seen as being in competition for control over behavior (e.g., Strack & Deutsch, 2004). In the ART, it is assumed that conflict may arise between a fundamentally affective Type-1 process and all rational considerations that may occur in Type-2 processes (Figure 4.4).

Figure 4.4

Illustrating of Negative Core Affective Feelings as a Restraining Force

Note. According to the ART, negative core affective feelings (e.g., "Exercise feels unpleasant") may present a restraining force to rational reflection about, for example, the benefits of exercise (e.g., "I know exercise is healthy"). Image of boxing gloves courtesy of royalty-free photo from Pickpik.

The ART fundamentally differs from other dual-process models (e.g., Strack & Deutsch, 2004; Conroy & Berry, 2017) in regard to how affect is conceptualized. In the field of social cognition, various authors have pointed out that fundamentally cognitive Type-1 processes may be affectively tinged or colored in certain ways (e.g., Strack & Deutsch, 2004). The concept of a "gut feeling" as a process output is also invoked extensively in the unimodel view (Gigerenzer, 2007). However, and this is the crux, gut feeling in all these earlier psychological works is used as a label for an otherwise ill-defined mental state. This is different in the ART. Here, the possible Type-1 restraining force is explicitly specified as a distinct core affective state. Let us explain.

Core affect is the experiential substrate of an organism's neurophysiological and somatovisceral state. In this regard, core affective feelings give us summaries about the condition of the body (e.g., the perturbation or satisfaction of homeostatic needs). Although it is difficult from a neuroscientific point of view to anatomically and functionally separate the cognitive from the affective in the brain, people experience core affective feelings as phenomenologically distinct from thoughts (Duncan & Feldman Barrett, 2007). In some of the frameworks discussed above, the affective gut feeling is often reduced to its cognitive reflection (e.g., as if asking oneself "how do I feel?", thus turning feeling into another piece of information subject to reflection). This is consistent with the mainstream in general cognitive psychology, which aims to explain all behavioral domains in terms of cognitive processes.[13] Nevertheless, it is problematic with regard to the explanation of physical inactivity (i.e., avoidance of PA and exercise) and the resulting recommendations for intervention.

As appropriate and useful as previous dual-process theories (e.g., Chaiken & Trope, 1999) and unimodel theories of social cognition (e.g., Gigerenzer & Gaissmaier, 2011) may have been to explain, for example, racist behavior or expert judgment and decision making, behaviors like these feel—in a somatic sense—very different compared to physical exercise. The feature of the ART that distinguishes it from other dual-process theories (e.g., Strack & Deutsch, 2004; Gawronski & Bodenhausen, 2006; as well as Conroy & Berry, 2017) is that it incorporates an explicitly hedonic perspective (Ekkekakis & Zenko, 2016) within the dual-process framework, by emphasizing the significance of exercise-related core affect as the core feature of its Type-1 process.

The Exercise Experience

In contrast to other theories in the beginning of the chapter, the ART explicitly and exclusively refers to one specific behavioral domain, namely physical inactivity and exercise. But wait, is that two or just one? Let us explain.

From a public health perspective, it is important to distinguish behaviors like taking the stairs and walking for transportation (i.e., PA) from going to the gym and jogging (i.e., exercise). After all, the former may be easier to integrate into one's daily routine and can be achieved incidentally, whereas the latter usually needs to be planned, often requires extra time, and may, therefore, be more difficult to adopt as an element of one's lifestyle. However, both will trigger similar physiological adaptations in the body, and both can accrue important health benefits. For people who have been physically inactive for years and are perhaps overweight, climbing stairs may cause as much sweating and heavy breathing as running would for a trained exerciser. We all understand this, as part of our everyday experiences: the more intense a PA is, the stronger the cardiovascular response will be.

Let us then relate this to the question of how PA, namely the physiological state aroused by it, feels. Exercise psychology studies provide evidence-based answers to this question (see Ekkekakis & Brand, 2019). During PA or exercise performed at moderate intensity, most people report that they feel increased pleasure (i.e., pleasant core affect). Heavy intensity, which is challenging though not yet overwhelming, triggers feelings of reduced pleasure especially in the untrained, whereas more experienced exercisers may still report rising pleasure. Feelings of reduced pleasure or even rising displeasure prevail under severe intensity. After a bout of strenuous exercise has ended, most people report a positive *affective rebound* (e.g., think of the rush of pleasure one feels within minutes after a strenuous bout has ended and the cool-down has begun). Some people may be (rightly) proud of having made it through the bout, even though the activity was exhausting, whereas others will be just relieved that the hard effort is over. Although only a few studies have examined whether feelings during and

[13] In the psychology of judgment and decision making, too, signs are emerging for a paradigmatic shift towards what has been termed *embodied cognition*. A conceptual framework related to the domain of sporting activities has recently been published by Raab (2020).

after PA or exercise influence future PA behavior, it appears that, while the correlation between in-task (i.e., during-exercise) reports of pleasure-vs-displeasure correlate with subsequent PA, the correlation between postexercise affect and future behavior is near-zero (Rhodes & Kates, 2015). A possible explanation for this near-zero correlation may be that ratings of pleasure after bouts of exercise or PA generally tend to be positive (i.e., with limited interindividual variation), concealing whether this positivity reflects a continuation of positive feelings throughout the experience or a postexercise rebound from negativity to positivity.

Furthermore, it is known from anecdotal reports and survey studies that many people who do not like exercise and tend to avoid it report negative past affective experiences, such as those associated with physical education (e.g., Ladwig et al., 2018; Massey et al., 2021), or recall negative affect from previous attempts (e.g., Ekkekakis et al., 2016). What is becoming increasingly clear from these sources is that it is not only the somatic perceptions during exercise (e.g., pain, discomfort, breathlessness, exhaustion) that may be influential for future behavior. Negative memories associated with the social and cultural environment within which exercise experiences are embedded are also important (e.g., embarrassment, humiliation, or feelings of guilt). Both unpleasant somatic experiences and social emotions can make negative feelings reappear at the very thought of doing something similar.

Together, these insights have formed the third fundamental postulate of the ART of physical inactivity and exercise: the ART assumes that individuals often remain in their current state of physical inactivity because of their unpleasant experiences with exercise-related situations in the past. Importantly, exercise-related situations include even those that make you feel "as if" you are exercising (e.g., breathing hard while hurrying up a flight of stairs, or feeling bad because you think you are clumsy). In response to an exercise-related stimulus, these experiences are automatically recalled, and associated sensations may be re-actualized. If this Type-1 process evokes a negative feeling, this can provide a restraining force that opposes any subsequent rational reflection and evaluation (Type-2 process) that might tend to propel the individual to be active.

Photo by RUN 4 FFWPU from Pexels

The ART Process Model

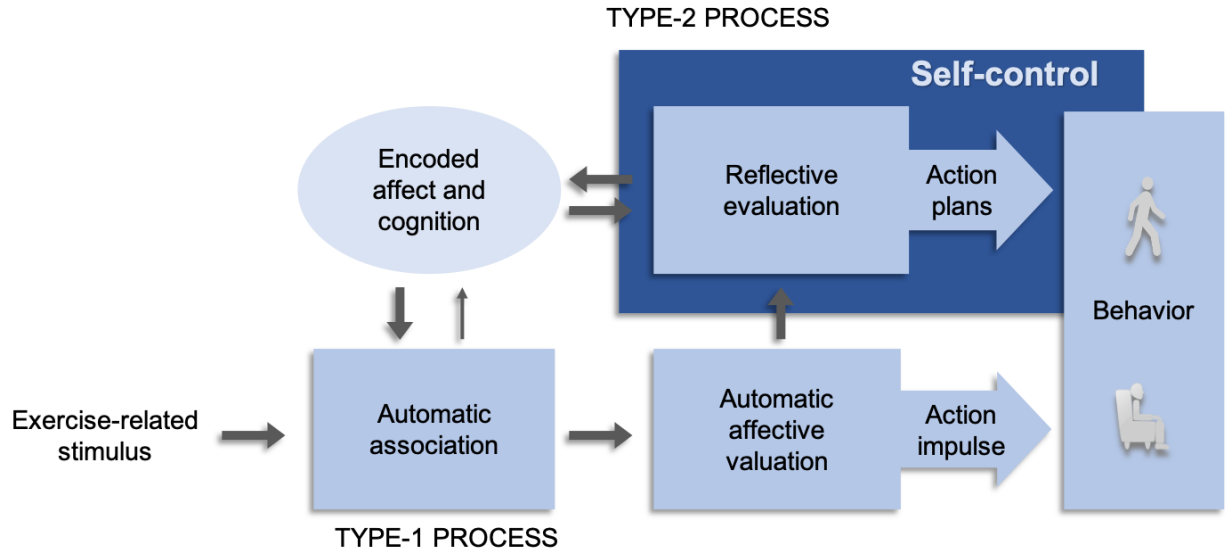
The first step in understanding the ART (Figure 4.5) is to think of a situated process, in which an individual notices an exercise-related stimulus. It is presumed that this typically leads to an immediate psychological response, though only sometimes to an observable change in behavior. Exercise-related stimuli can be external (e.g., someone telling you to get off the couch to go exercise) or internal (e.g., a cyclist thinks about continuing a little while longer). Once noticed, a stimulus will trigger a Type-1 process first.

The Type-1 Process

This Type-1 process involves the activation of *automatic associations*. These can be understood as the individual's spontaneous recollection of situations akin to the behavioral option that was brought to mind by the stimulus. Automatic associations give rise to what has been termed the *affective valuation* of the behavioral option in the ART. The affective valuation is a feeling of pleasure or displeasure, depending on the associations that past exercise-related stimuli have established. This response is conceptualized as a minimal core affective response, inherently imbued with an *approach impulse* if positive affective valence is felt and an *avoidance impulse* if the valuation is negative.

Figure 4.5

Process Model of the Affective-Reflective Theory (ART) of Physical Inactivity and Exercise



Note. Reproduced from Brand, R. & Ekkekakis, P. (2018). Affective-reflective theory of physical inactivity and exercise. *German Journal of Exercise and Sport Research, 48,* 48–58 (2018). https://doi.org/10.1007/s12662-017-0477-9 under a Creative Commons Attribution License (CC BY).

The Type-2 Process

According to the ART, the Type-1 process is followed by more rational consideration only if the person is willing and able to apply cognitive *self-control* (Gillebaart, 2017) for the *reflective evaluation* of the exercise-related stimulus (for more on self-control, see Chapter 22; Englert et al., 2021). This requires the individual to deliberately process and confront the associations, feelings, and the behavioral impulse that accompanied the encounter with the exercise-related stimulus as the result of the preceding Type-1 process. The Type-1 process, therefore, provides an affective default value for the subsequent Type-2 processing. The Type-2 process may include addressing the more complex emotions

arising from memories of past experiences, as well as rational thought processes, such as thoughts about the pros and cons of a possible change in behavior, self-efficacy beliefs, or one's personal values as they relate to the situation. The Type-2 process can result in an *action plan* (e.g., an intention to be active) that may either (a) build upon the approach or avoidance impulse generated by the Type-1 process, or (b) lead in the opposite direction. In the latter case (i.e., when the two forces are in conflict), it is again a question of whether a person is willing and able to apply self-control to enforce the decision to change behavior in the rationally preferred way and whether, in the end, the action plan will be carried out or not. This is why the Type-2 process can be seen as the "interventionist" that may or may not devaluate the automatic affective response to the exercise-related stimulus (which also explains why the ART is a default-interventionist model).

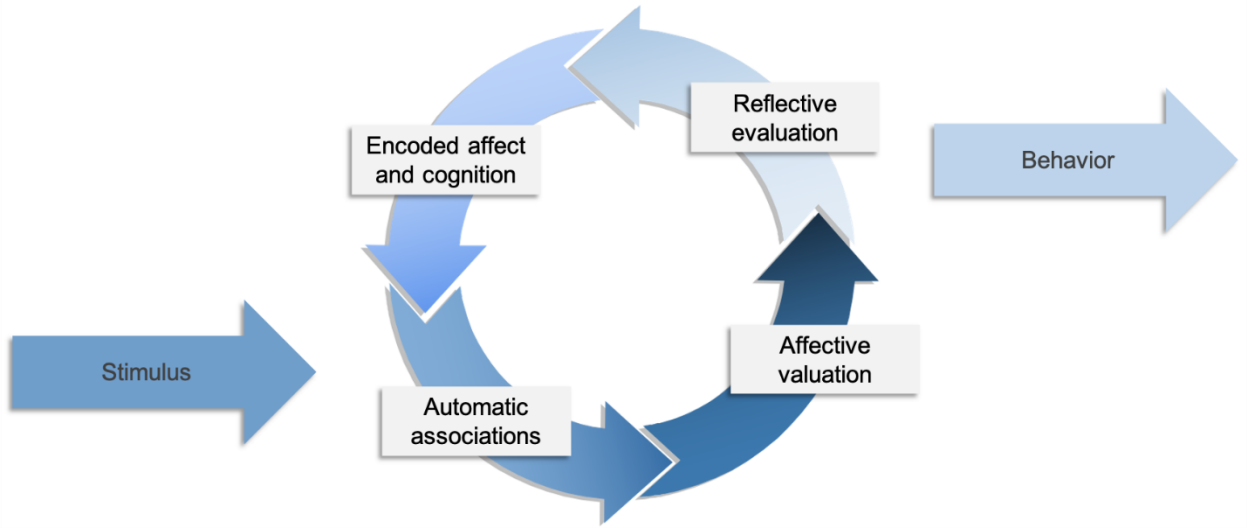
Process Interaction

The linear sequence of processes and elements described above is a useful simplification, intended to facilitate the understanding of the basic assumptions and postulates of the ART and how they can be tested. However, like most models, this likely represents an oversimplification of the psychological processes involved. Perhaps a more realistic approach would be to consider that the two processes are in constant interaction (Figure 4.6).

There may be stimuli for which the automatic affective valuation is so strong that it enters consciousness even without the need to deliberately focus our attention on this response. Often, however, the affective valuation may be more subtle and may only be noticed if one deliberately reflects on a possible behavioral change. Reflecting on the exercise stimulus and actively dealing with the initial feeling will, in turn, influence how one feels. For example, an unpleasant feeling evoked at the idea of having to go for a run might turn into full-blown affective aversion only after the more reflective examination of this behavioral option; this feeling will again be automatically sensed, and will "color" further reflection accordingly. That is why the linear sequence of elements outlined in Figure 4.5 must be understood as a regulatory process loop (as indicated by the arrows in Figure 4.6), which, once the Type-2 process is involved, will come to an end when individuals stop reflecting on whether they want to change their behavior now.

Figure 4.6

Constant Interaction of the Type-1 and the Type-2 Processes in the Affective-Reflective Theory



Learning

Imagine a person who has never (ever!) been physically active (theoretically; this is just a thought experiment). Let's assume that this person encounters, for the first time, an exercise-related stimulus. For example, some friends may ask our novice exerciser, let's call her Claudia, if she would join them for a run. This question would ordinarily trigger automatic associations stemming from past experiences with running or exercise, in general. In our example, however, associations directly related to running cannot arise, because Claudia has not yet had *any* experience with PA. Let us assume that Claudia's automatic affective valuation of that unknown, novel behavior will be positive, perhaps because she knows and likes the individuals asking or has heard in the news that exercise is supposed to make people feel better. So, an immediate approach impulse would follow. Claudia takes the time to reflect on whether she has the time to follow her friends' invitation anyway. Thoughts and feelings are weighed and finally lead to the intention to join in the run. While exercising, Claudia learns a lot. Her friends explain that exercising is healthy. However, running is exhausting and having to breathe so heavily doesn't feel good. To make matters worse, her friends grin about Claudia's puffing red face. In the evening, Claudia thinks that it might not have been worth the effort.

A few days later, Claudia is sitting on the couch and remembers that exercise is said to be healthy. Automatic associations, which are based on encoded affect and thoughts about her first experience with exercising, are triggered immediately.[14] The mere thought of exercise sparks an uneasy feeling (automatic affective valuation), and Claudia literally sinks a little deeper into the couch (the action impulse). She ponders that exercise, although supposed to be healthy, was quite strenuous, and she remembers that the people who saw her last time must have had a great laugh about her silly red face (reflective evaluation). Thinking about it like this, Claudia's memory of it gets worse and worse (encoded affect and cognition). But although something inside her resists (the automatic negative affect, a restraining force), Claudia actively (self-control) decides to get up and go out for one more try.

What do you think? How does this story continue? This example is designed to illustrate a general psychological principle as the central learning mechanism incorporated in the ART. The *law of effect*, whose origin dates to the era of behaviorism (Thorndike, 1911) but remains widely adopted in modern associationist models of thinking and behavior (Mandelbaum, 2020), states that, if a behavior is paired with pleasure, it becomes more likely to be repeated, whereas, if it is paired with displeasure, it becomes more likely to be avoided. This must not be misunderstood as an assertion that people only do what they find pleasant, and always avoid what they find unpleasant (Murphy & Eaves, 2016). Rather, with regard to the ART, our main point is to emphasize that the acceptance or avoidance of exercise routines is primarily the psychological result of repeated physical experiences with exercise and exercise-related behaviors (i.e., experiential learning) and not primarily the result of gaining knowledge, for example, about the benefits of exercise and information about how to change one's own behavior. In other words, affect matters.

The regulatory loop explained above (Figure 4.6), together with the reinforcement mechanism postulated in the law of effect, provide the basis for the (necessary) "learning to like exercise," which is an essential feature of the ART.

Empirical Evidence

The ART was published in 2018, building upon initial empirical findings that made the central postulates of the theory seem not only plausible but justified.[15] Since then, more data have been

[14] The activation of these associations makes it more likely that they will reappear as soon as Claudia thinks about exercise on another occasion (indicated by the small arrow pointing upwards from automatic associations to encoded affect and cognition in Figure 4.5).

[15] These are presented in the original publication of the ART by Brand and Ekkekakis (2018).

produced. For example, initial studies have assessed the somatic core of the automatic affective valuation of exercise-related stimuli. Heart rate variability may be a useful indicator for this. Studies have shown, for example, that exercisers' and nonexercisers' heart rate variabilities differ significantly during the presentation of exercise-related pictures (Schinkoeth et al., 2019; Schinkoeth & Brand, 2019).

The results of a study using eye-tracking methodology are also interesting (Cheval et al., 2020). Cheval and colleagues (2020) showed that exercise-related stimuli induced an approach impulse (an attentional bias directed at the exercise-related stimulus) only in study participants who reported being regularly physically active.

Moreover, the importance of self-control, namely the theorized "condition" in the ART under which reflective processes are expected to influence behavior more strongly, has been underlined recently in systematic reviews (Audiffren & André, 2019). It has been shown, for example, that improvements to executive function predict PA maintenance after exercise interventions especially when environmental support for PA is low (Best et al., 2014). Executive functions help to convert intentions into physically active behavior, thereby supporting a central claim of the ART (Pfeffer & Strobach, 2017), and arguing in favor of models specifying this role for self-control processes (Strobach et al., 2020). Other authors have illustrated that people are less likely to exercise on days when they feel stressed (Englert & Rummel, 2016).

Furthermore, the authors of a new meta-analysis (Chevance et al., 2019) concluded that the correlation between automatic associations and PA is significant, albeit small. However, the observed small effect size is most likely due to the fact that the authors could only include empirical studies that focused exclusively on the direct relationship between automatic associations and behavior. This approach does not take into account the theorized (in the ART) moderation of this relation by self-control. When self-control is applied effectively, human behavior would be mainly controlled by reflective processes and this would, therefore, attenuate the magnitude of the correlation between automatic processes and behavior. This more complex relationship between automatic processes, self-control, and behavior warrants further research.

Notwithstanding such progress in empirical studies, it is important to note that the ART is still a relatively recent theory. Therefore, further studies are certainly needed. We would like to especially encourage the initiation of applied research programs, to investigate the usefulness of ART-derived intervention elements. In this early phase of research, pilot studies are valuable (e.g., Vazou et al., 2019), as will be more elaborately planned long-term RCTs (e.g., Ladwig et al., 2021).

Conclusion

We have illustrated that the psychologically informed interventions developed and tested over the past several years, which aim to motivate people to be more physically active, and perhaps even exercise, have resulted in generally small and short-lived effects. For exercise psychology, a field of research that has existed for approximately 50 years, this is a disappointing track record; all the more so as the number of published studies in exercise psychology seems to continually increase year by year! One reason for this incongruity could be that the majority of studies published so far were based on a few repeatedly used cognitivist theories. What these theories have in common is that they all rely on the assumption of an omnipotent human rationality and people's (presumably, unlimited) ability to process information as the key to behavior change.

We believe, as we have outlined here, that an attempt should be made to reconsider this difficult problem from the ground up. Alternative theories must be developed, so that innovative approaches to intervention can emerge and be tested.

We have explained our concern that such a transition to new fundamentals (theories) in exercise psychology might not be easy because researchers may be reluctant to accept the reorientation

(i.e., run fewer basic research studies based on established mainstream theories) and change the way in which research is done at universities (i.e., conduct more long-term research projects, abolish the excesses of the publish-or-perish mentality in academia).

We have proposed the affective-reflective theory (ART) of physical inactivity and exercise as a new alternative approach. The ART refers fundamentally to people's previous affective experiences during PA and exercise. According to the ART, exercise-related memories and feelings appear automatically at the mere thought of exercise (affective valuation) and can function as a restraining force that makes it difficult for individuals to follow their rational thoughts and action plans. Therefore, when it comes to behavior change, it is important to assure that the prospect of PA or exercise is consistently coupled with pleasant feelings (i.e., positive affective experiences). We hope that researchers pursuing a much-needed breakthrough in exercise psychology will actively engage in the critical testing of this theory in the near future.

Learning Exercises

1. Review what the terms "statistical significance" and "effect size" mean. Why is it important to look at more than just the statistical significance of results when assessing scientific evidence?

2. Describe how the two goals of "truth" and "usefulness" relate to each other in psychological basic research and applied research programs. [For advanced students: Why is it that evidence-based nomological statements from basic research programs cannot be used to derive statements about the effectiveness of interventions?]

3. Why are "leaps of knowledge" rather unlikely during times of "normal science" (Kuhn, 1992/1996)? Can you relate this notion to the current situation in exercise psychology?

4. Recall the early research findings of Wason and Evans (1975) that marked the historical origin of current dual-process theorizing in psychology. What are the implications of those early findings, for example, for the use of self-report methodology (questionnaires and interviews) in today's exercise psychology?

5. How is the "exercise experience" fundamentally different from the experience of, for example, having voted in a presidential election for the first time?

6. According to the affective-reflective theory (ART), the affective valuation of an exercise-related stimulus is part of a type-1 process, which provides the impulse to either avoid or approach exercise or physical activity. What is a *type-1 process*? What is meant by *affective valuation*?

7. Describe how, according to affective-reflective theory (ART), affective valuations are learned. How should exercise-related interventions be designed so that a positive affective valuation of exercise can be learned?

Further Reading

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