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People have feelings! Exercise psychology in paradigmatic transition

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Exercise psychology has yet to produce intervention methods capable of increasing exercise and physical activity behavior in a sustainable manner. This situation is forcing a critical reevaluation of current conceptual models, especially the assumption that behavioral decisions are driven solely by the rational evaluation of information. Like other behavioral sciences, exercise psychology is transitioning to dual-process models that acknowledge the importance of non-reflective processes. Emerging evidence suggests that the pleasure or displeasure experienced during exercise may influence subsequent physical activity. These data raise the possibility of inactivity resulting from a conflict between positively evaluated information on health benefits and unpleasant affective experiences. Thus, researchers must devise methods to make exercise and physical activity more pleasant and enjoyable across the lifespan.

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Introduction

Exercise psychology is a relatively young field of scientific inquiry, with a history of less than half a century. One of its main research directions examines the effects of psychological factors (*e.g.*, motivation) and interventions on exercise and physical activity behavior. Despite considerable progress, this research direction has yet to yield findings that can be translated to behavior-change interventions likely to be of appreciable value at the societal level. This is a consequential failure, with measurable impact on global public health. It is estimated that, if physical inactivity could be reduced by 10% worldwide, this could avert more than a half-million deaths annually [1]. However, so far, there have been no 'success stories' of population-level increases in physical activity of this magnitude—or even close to this magnitude. Interventions to promote physical activity in various settings have only small positive effects that diminish over time [2,3].

Moreover, there is proliferating evidence that the severity of the problem of physical inactivity had been underestimated. For example, earlier surveys based on self-reports of physical activity estimated that 30–50% of the adult population in the United States could be characterized as adequately active [4]. However, based on objective assessments with accelerometers from the 2005–2006 National Health and Nutrition Examination Survey, the prevalence of adequate physical activity is only between 3.2% [5] and 9.6% [6]. Similarly, based on exercise intervention studies, which are of limited duration and typically include components designed to prevent attrition, the average rate of dropout from exercise had been estimated as 45% [7]. However, newer estimates from community or commercial exercise programs reveal that dropout in real-life settings is likely higher. For example, according to attendance and membership records of 5240 members of a fitness center in Brazil, dropout reached 47% already by the second month, 86% by the sixth month, and was nearly complete (96%) by the twelfth month [8].

Public health campaigns utilizing social marketing techniques focused on education can be credited with several notable accomplishments over the past few decades, including decreases in the rates of cardiovascular and cerebrovascular disease, the transmission of HIV, and cigarette smoking [9]. Experts have argued that the promotion of physical activity has not received an investment of resources proportional to its societal importance [10,11]. While this may be a valid point, the persistent lack of interventions that can reliably increase physical activity and prevent dropout is a source of puzzlement and frustration for public-health researchers and practitioners.

Limitations of the rational-educational model

This situation is forcing a reconsideration of the fundamental assumptions that have been underpinning physical activity promotion interventions. In the standard framework of public health campaigns, human beings are modeled as rational thinkers who systematically collect, rationally evaluate, and reliably act upon information that is relevant to their prime objective, namely the promotion of their self-interest (*i.e.*, staying alive, healthy, and happy). Intervention methods based on these

theoretical models thus follow a 'rational-educational' model [12]. If individuals are provided with correct, complete, and engagingly presented information related to the behavior, the expectation is that individuals will change their behavior in the desired direction. For decades, campaigns to promote physical activity have adhered to this approach, focusing on such factors as raising awareness of the anticipated benefits compared to costs, strengthening confidence in the ability to maintain regular physical activity, and pointing out available sources of social support. As an example, the recommendation by the Centers for Disease Control and Prevention and the American College of Sports Medicine culminated in this call to action, which reflects the notion that educating the population about the health benefits of regular physical activity is the avenue that leads to behavior change: "Successfully changing our sedentary society into an active one will require effective dissemination and acceptance of the message that moderate physical activity confers health benefits" (p. 405) [13].

Contrary to this expectation, it now appears that, possibly more than any other health behavior, physical activity is disconnected from the awareness of its health benefits. The fact that physical activity is widely recognized as a 'best buy' in public health but is proving to be a 'tough sell' to the public represents a challenging paradox [14]. In the United States, 97% adults reported that they considered the lack of physical activity a health risk factor (52% as 'very important,' 37% as 'important,' 8% as 'somewhat important') [15]. However, as noted earlier, nationwide surveys based on objective measurement of physical activity with accelerometers showed that more than 90% of American adults were less active than the minimum level recommended for health promotion [5,6]. In a 2008 nationwide survey of Canadians aged 15 years and older, 78% gave the highest score (7 out of 7: 'very strongly agree') in response to a question on whether physical activity helps to prevent heart disease [16]. However, based on data collected with accelerometers between 2007 and 2009, only 4.8% did at least 30 min of moderate-to-vigorous physical activity, accumulated in bouts of at least 10 min, on at least 5 days per week and 15.4% did at least 150 min per week of moderate-to-vigorous physical activity accumulated in bouts of at least 10 min [17]. In Britain, 89% of men and 91% of women expressed the belief that physical activity confers meaningful health benefits [18] but 94% and 96%, respectively, were not physically active at the minimum recommended level [19].

The field of public health is now beginning to come to terms with the realization that its standard operating approach based on education has failed in the case of physical activity. According to the Lancet Physical Activity Series Working Group (the qualifiers 'to some extent' and 'so far' notwithstanding), "the traditional public health approach based on evidence and exhortation has – to some extent – been unsuccessful so far" (p. 254) [20]. In essence, the field is facing a paradigmatic crisis, as it is becoming apparent that the theoretical modeling is inconsistent with the available data [21]. Paradigmatic crises provide fertile ground for scientific advances. Since the 'information processing' paradigm that stands to be replaced has been the sole perspective through which health behaviors have been conceptualized for over a half century, it is reasonable to anticipate a long period of resistance and 'essential tension' between 'tradition' and 'innovation' [22].

Human rationality: bounded or unbounded?

The crucial question at this stage is this: if health behaviors are not driven solely by the deliberative contemplation of information by rational actors, what other factors are involved and how do these 'other factors' interact with the rational/deliberative processes of the human mind? Exercise psychology can utilize the experience gathered in fields that have already questioned the validity of the assumption of rationality and have attempted the transition to the postcognitivist era. The fact that human beings frequently act in ways that are inconsistent with or contrary to their self-interests, even when possessing information about the deleterious consequences of their actions or inactions, is becoming more widely recognized in behavioral economics [23,24], certain areas of psychology [25], and in the study of health behavior [26••,27,28,29••]. Experimental manipulations designed to demonstrate that human choices often violate the assumption of rationality and tend to rely instead on certain well-characterized heuristics (*i.e.*, shortcuts or simplified rules that are prone to errors) yield robust results in the predicted direction in a variety of contexts, including exercise [30•].

Reemergence of affect as an important driver of behavior

It is becoming apparent to a growing number of researchers that what has been missing in current thinking on the psychological processes that drive physical activity behavior is consideration of the motivational and demotivational role of affect. The first voices have started to emerge calling for a shift of emphasis in the messages used to promote physical activity, from providing data on long-term health benefits to simpler messages focusing on short-term affective regulation. For example, in the field of public health, de Souto Barreto [31] wrote: "since health-based models have failed to promote physical activity to the extent necessary, we must shift the argument from the finality or utility of physical activity (*i.e.*, promoting health) to what a person experiences when physically active . . . Information on the health benefits of physical activity should be part of this new model, but not the central part" (p. 390). Expressing essentially the same perspective from observations from the field of

cardiology, Shrank and Choudhry [32] stated: "changing patient behavior is extremely difficult [because] patients do not adhere to activities that they know can improve their health" (p. 264). As a solution, "perhaps we need to find a way to make doing the right thing 'feel good' to patients—in the same way that expensive television commercials persuade consumers to associate certain emotions with their products" (p. 264). This could be accomplished if we could somehow establish a "very basic, subconscious connection between happy feelings and certain behavior" (p. 265).

Toward dual-process models of exercise and physical activity behavior

Exercise psychology is undergoing a transition to dual-process theoretical models for conceptualizing the mechanisms that shape behavioral decisions about participation or nonparticipation in exercise and physical activity. Dual-process models have proliferated in cognitive science [33], social cognition [34,35], and health psychology [36,37].

Dual-process models exhibit considerable differences in terminology, specific theoretical postulates, and assumptions about underlying brain systems and processes. Nevertheless, they share the fundamental premise that the human mind incorporates two functionally distinct systems that jointly determine behavioral choices. One system, commonly termed 'System 2' or 'Type 2' to indicate its late phylogenetic and ontogenetic origins, reflects the deliberative mental operations typically postulated in cognitivist theories. In other words, behavioral decisions based on System 2 stem from the contemplation of acquired information on the relative pros and cons of each alternative and probabilistic predictions about their future consequences. The other system, termed 'System 1' or 'Type 1' to indicate its primordial evolutionary and developmental origins, reflects the formation of an associative pairing, formed over several episodes in the life course of an individual, of a stimulus with a valenced experience (positive or negative, pleasant or unpleasant). Dual-process models seek to elucidate the rules governing the constant interaction between these two systems that presumably reflect different priorities and rely on different principles of operation. Type 1 processes are theorized to be effortless and automatic, requiring little or no cognitive involvement and, therefore, also likely to be relatively impervious to cognitive control. On the other hand, Type 2 processes are flexible, controlled, and dependent on cognitive resources. Presumably, if a certain behavioral option is evaluated positively through Type 2 processes and has resulted in pleasant experiences in the past, it is likely to be selected again. Conversely, it seems reasonable to assume that options that are neither evaluated positively nor paired with pleasure will likely be avoided. The more intriguing and challenging interactions arise in cases of conflict.

Recent applications of dual-process theorizing to physical activity and exercise behavior have highlighted the possibility that chronic hypoactivity is the manifestation of a conflict between negatively laden Type 1 and positively laden Type 2 processes, with the more efficient Type 1 processes serving as the 'default' mode [38••, 39–41,42••]. Specifically, according to these proposals, most adults in western countries, burdened by excess body mass and deconditioned cardiorespiratory systems, have associated physical activity and exercise with reductions in pleasure [14]. These unpleasant experiences stem from the inability to maintain a physiological steady state during common physical activities of daily living. Somatic cues like muscle acidosis, elevated core body temperature, or inflamed and painful joints collectively form a negatively laden 'somatic marker' [43] associated with physical effort. Thus, despite exposure to social marketing campaigns about the health benefits of exercise and physical activity, ample sources of social support, expert encouragement from health professionals, and serious personal commitments (*e.g.*, New Year's resolutions), most individuals who initiate a program of regular activity in middle or old age tend to revert to hypoactivity after a number of attempts that result in displeasure or discomfort. Consistent with this scenario, most early studies show that affective responses to exercise significantly predict subsequent physical activity behavior [40,44]. Moreover, preliminary evidence suggests that manipulating affective responses to exercise may improve subsequent adherence [45•].

The reemergence of affect as a potentially powerful driver of behavioral decisions within the framework of dual-process models underscores the need for a new distribution of research effort in the field of exercise psychology. Alongside methods of improving explicit attitudes or bolstering self-efficacy, researchers are called to invest time and effort into investigations designed to develop and test methods of making the experience of exercise and physical activity more pleasant for individuals across all stages of life [46,47••].

Conflict of interest statement

Nothing declared.

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References and recommended reading

Papers of particular interest, published within the period of review, have been highlighted as:

- • of special interest
- •• of outstanding interest

1. Lee IM, Shiroma EJ, Lobelo F, Puska P, Blair SN, Katzmarzyk PT: **Effect of physical inactivity on major non-communicable diseases worldwide: an analysis of burden of disease and life expectancy**. *Lancet* 2012, **380**:219-229.

2. Foster C, Hillsdon M, Thorogood M, Kaur A, Wedatilake T: **Interventions for promoting physical activity**. *Cochrane Database Syst. Rev.* 2005, **1** CD003180.

3. Orrow G, Kinmonth AL, Sanderson S, Sutton S: **Effectiveness of physical activity promotion based in primary care: systematic review and meta-analysis of randomised controlled trials**. *BMJ* 2012, **344**:e1389.

4. Carlson SA, Densmore D, Fulton JE, Yore MM, Kohl HW III: **Differences in physical activity prevalence and trends from 3 U.S. surveillance systems: NHIS, NHANES, and BRFSS**. *J. Phys. Act. Health* 2009, **6**:S18-S27.

5. Tudor-Locke C, Brashear MM, Johnson WD, Katzmarzyk PT: **Accelerometer profiles of physical activity and inactivity in normal weight, overweight, and obese U.S. men and women**. *Int. J. Behav. Nutr. Phys. Act* 2010, **7**:60.

6. Tucker JM, Welk GJ, Beyler NK: **Physical activity in U.S.: adults compliance with the Physical Activity Guidelines for Americans**. *Am. J. Prev. Med.* 2011, **40**:454-461.

7. Marcus BH, Williams DM, Dubbert PM, Sallis JF, King AC, Yancey AK, Franklin BA, Buchner D, Daniels SR, Claytor RP: **Physical activity intervention studies: what we know and what we need to know**. *Circulation* 2006, **114**:2739-2752.

8. Sperandei S, Vieira MC, Reis AC: **Adherence to physical activity in an unsupervised setting: explanatory variables for high attrition rates among fitness center members**. *J. Sci. Med. Sport* 2016, **19**:916-920.

9. Koppaka R: **Ten great public health achievements worldwide, 2001–2010**. *MMWR* 2011, **60**:814-818.

10. Blair SN: **Physical inactivity: the biggest public health problem of the 21 st century**. *Br. J. Sports Med.* 2009, **43**:1-2.

11. Sallis JF: **A proportional public health response to physical inactivity**. *J. Public Health Manag. Pract.* 2012, **18**:399-401.

12. Weare K: **The contribution of education to health promotion**. In *Health Promotion: Discipline, Diversity, Developments,* 2nd ed. Edited by Bunton R, Macdonald G.Routledge; 2002:102-125.

13. Pate RR, Pratt M, Blair SN, Haskell WL, Macera CA, Bouchard C, Buchner D, Ettinger W, Heath GW, King AC *et al.*: **Physical activity and public health: a recommendation from the Centers for Disease Control and Prevention and the American College of Sports Medicine**. *JAMA* 1995, **273**:402-407.

14. Ekkekakis P, Parfitt G, Petruzzello SJ: **The pleasure and displeasure people feel when they exercise at different intensities: decennial update and progress towards a tripartite rationale for exercise intensity prescription**. *Sports Med.* 2011, **41**:641-671.

15. Martin SB, Morrow JR Jr, Jackson AW, Dunn AL: **Variables related to meeting the CDC/ACSM physical activity guidelines**. *Med. Sci. Sports Exerc.* 2000, **32**:2087-2092.

16. Canadian Fitness and Lifestyle Research Institute: **Bulletin 8: beliefs about the benefits of physical activity**. Author; 2009

17. Colley RC, Garriguet D, Janssen I, Craig CL, Clarke J, Tremblay MS: **Physical activity of Canadian adults: accelerometer results from the 2007 to 2009 Canadian Health Measures Survey**. *Health Rep.* 2011, **22**:1-8.

18. O'Donovan G, Shave R: **British adults' views on the health benefits of moderate and vigorous activity**. *Prev. Med.* 2007, **45**:432-435.

19. National Health Service Information Centre, Lifestyle Statistics: **Statistics on obesity, physical activity and diet: England, 2012**. Author ; 2012.

20. Hallal PC, Andersen LB, Bull FC, Guthold R, Haskell W, Ekelund U: **Global physical activity levels: surveillance progress, pitfalls, and prospects**. *Lancet* 2012, **380**:247-257.

21. Kuhn TS: *The Structure of Scientific Revolutions*. University of Chicago Press; 1962/1996.

22. Kuhn TS: *The Essential Tension: Selected Studies in Scientific Tradition and Change*. University of Chicago Press; 1977.

23. Simon HA: **Rationality in psychology and economics**. *J. Bus.* 1986, **59**:S209-S224.

24. Simon HA: **Bounded rationality in social science: today and tomorrow**. *Mind Soc.* 2000, **1**:25-39.

25. Shafir E, LeBoeuf RA: **Rationality**. *Annu. Rev. Psychol.* 2002, **53**:491-517.

26. •• Corrigan PW, Powell KJ, Michaels PJ: **Beyond the rational patient: implications for health decisions and behaviors**. In *Person-centered Care for Mental Illness: The Evolution of Adherence and Self-determination.* Edited by Corrigan PW. American Psychological Association; 2015:29-51.
Lucid critique of the rational patient model and a helpful introduction to the role of implicit processes in health behaviors. Also underscores the importance of emotional and interoceptive factors.

27. Corrigan PW, Rüsch N, Ben-Zeev D, Sher T: **The rational patient and beyond: implications for treatment adherence in people with psychiatric disabilities**. *Rehabil. Psychol.* 2014, **59**:85-98.

28. Rice T: **The behavioral economics of health and health care**. *Annu. Rev. Public Health* 2013, **34**:431-447.

29. •• Roberto CA, Kawachi I: **An introduction to behavioral economics and public health**. In *Behavioral Economics and Public Health.* Edited by Roberto CA, Kawachi I. Oxford University Press; 2016:1-26.
An accessible introduction to the field of behavioral economics, with insightful examples of its applications to public health. Explains the tole of heuristics and biases in human health behaviors.

30. • Zenko Z, Ekkekakis P, Kavetsos G: **Changing minds: bounded rationality and heuristic processes in exercise-related judgments and choices**. *Sport Exerc. Perform. Psychol.* 2016, **5**:337-351.
Empirical demonstrations of the bounded nature of human rationality. Important motivational variables such as the desirability of exercise, affective attitude, intention, affective forecasts, and exercise choices can be manipulated without providing new information, merely by altering contextual cues.

31. de Souto Batrreto P: **Why are we failing to promote physical activity globally?** *Bull. World Health Organ.* 2013, **91** 390–390A.

32. Shrank WH, Choudhry NK: **Affect and affirmations: a basic approach to promote adherence**. *Nat. Rev. Cardiol.* 2012, **9**:263-265.

33. Evans JSBT, Stanovich KE: **Dual-process theories of higher cognition: advancing the debate**. *Perspect. Psychol. Sci.* 2013, **8**:223-241.

34. Gawronski B, Bodenhausen GV: **Associative and propositional processes in evaluation: an integrative review of implicit and explicit attitude change**. *Psychol. Bull.* 2006, **132**:692-731.

35. Strack F, Deutsch R: **Reflective and impulsive determinants of social behavior**. *Pers. Soc. Psychol. Rev.* 2004, **8**:220-247.

36. Hofmann W, Friese M, Wiers RW: **Impulsive versus reflective influences on health behavior: a theoretical framework and empirical review**. *Health Psychol. Rev.* 2008, **2**:111-137.

37. Williams DM, Evans DR: **Current emotion research in health behavior science**. *Emot. Rev.* 2014, **6**:277-287.

38. •• Brand R, Antoniewicz F: **Affective evaluations of exercising: the role of automatic-reflective evaluation discrepancy**. *J. Sport Exerc. Psychol.* 2016, **38**:631-638.
Innovative research into the implications of discrepancies between reflective and automatic processes. Larger discrepancies between automatic and reflective evaluations were associated with larger mismatch between desired and actual exercise frequency.

39. Bluemke M, Brand R, Schweizer G, Kahlert D: **Exercise might be good for me, but I don't feel good about it: do automatic associations predict exercise behavior**. *J. Sport Exerc. Psychol.* 2010, **32**:137-153.

40. Ekkekakis P, Dafermos M: **Exercise is a many-splendored thing but for some it does not feel so splendid: staging a resurgence of hedonistic ideas in the quest to understand exercise behavior**. In *The Oxford Handbook of Exercise Psychology.* Edited by Acevedo EO. Oxford University Press; 2012:295-333.

41. Ekkekakis P, Vazou S, Bixby WR, Georgiadis E: **The mysterious case of the public health guideline that is (almost) entirely ignored: call for a research agenda on the causes of the extreme avoidance of physical activity in obesity**. *Obes. Rev.* 2016, **17**:313-329.

42. •• Ekkekakis P, Zenko Z: **Escape from cognitivism: exercise as hedonic experience**. In *Sport and Exercise Psychology Research from Theory to Practice*.. Edited by Raab M, Wylleman P, Seile R, Elbe AM, Hatzigeorgiadis A. Academic Press; 2016:389-414.
Critical review demonstrating that popular theories of exercise and physical activity behavior reflect a narrow information-processing perspective. Presents dual-process alternatives that incorporate affective processes.

43. Verdejo-García A, Bechara A: **A somatic marker theory of addiction**. *Neuropharmacol* 2009, **56(Suppl 1)**:48-62.

44. Rhodes RE, Kates A: **Can the affective response to exercise predict future motives and physical activity behavior? A systematic review of published evidence**. *Ann. Behav. Med.* 2015, **49**:715-731.

45. • Williams DM, Dunsiger S, Emerson JA, Gwaltney CJ, Monti PM, Miranda R: **Self-paced exercise, affective response, and exercise adherence: a preliminary investigation using ecological momentary assessment**. *J. Sport Exerc. Psychol.* 2016, **38**:282-291.
Experimental, albeit preliminary, study illustrating that a manipulation of the sense of autonomy can influence affective responses to exercise and these, in turn, can influence adherence.

46. Decker ES, Ekkekakis P: **More efficient, perhaps, but at what price? Pleasure and enjoyment responses to high-intensity interval exercise in low-active women with obesity**. *Psychol. Sport Exerc.* 2017, **28**:1-10.

47. •• Zenko Z, Ekkekakis P, Ariely D: **Can you have your vigorous exercise and enjoy it too? Ramping intensity down increases postexercise, remembered, and forecasted pleasure**. *J. Sport Exerc. Psychol.* 2016, **38**:149-159.
First study to test an exercise prescription informed by the evidence base of the disciplines of exercise science, psychology, and behavioral economics. This could be a promising approach to accelerate physiological adaptations without compromising positive affective experiences.