



## Sport participation and stress among women and men

Melinda Asztalos<sup>a,\*</sup>, Katrien Wijndaele<sup>a</sup>, Ilse De Bourdeaudhuij<sup>a</sup>, Renaat Philippaerts<sup>a</sup>, Lynn Matton<sup>b</sup>, Nathalie Duvigneaud<sup>c</sup>, Martine Thomis<sup>b</sup>, Johan Lefevre<sup>b</sup>, Greet Cardon<sup>a,\*</sup>

<sup>a</sup> Department of Movement and Sports Sciences, Ghent University, Watersportlaan 2, B-9000 Gent, Belgium

<sup>b</sup> Department of Biomedical Kinesiology, K.U. Leuven, Tervuursevest 101, B-3001 Leuven, Belgium

<sup>c</sup> Faculty of Physical Education and Physical Therapy, V.U. Brussel, Pleinlaan 2, B-1050 Brussel, Belgium

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### ABSTRACT

**Objectives:** In-depth analysis of the relationship between sports participation and stress among adult women and men.

**Design:** 644 women and 783 men, 20–65 years, from the SPAH Flemish-Policy-Research-Centre, reported data on participation in favourite sports and mental health.

**Method:** Gender-specific multiple MANOVAs with stress appraisal and the stress response of emotional distress as dependent variables, and participation in 15 different types of sports as independent variables, including effect sizes (Cohen's *d*) per sport-type.

**Results:** Very little difference in perceived-stress and emotional-distress existed in women and men who participated in different sport-types, suggesting that “one-activity-fits-all recommendations” are likely inappropriate. Different sports are suitable for different individuals, and it is important that one finds the sport that suits one best. Conversely, significant associations between participation in walking and in meditation sports manifested with both stress appraisal and emotional distress among women, and significant associations between participation in ball games and in water sports manifested with emotional distress among men.

**Conclusions:** The paper gathered substantial comprehensive insight and connected its quantitative data to existing qualitative data, presenting stimulating theoretical arguments. Sport-type related variations in the physical activity – mental health relationship were analyzed, based on the theory of mindful movement and the complexity paradigm identifying 3 coordinates on which the physical activity – mental health complexity unravels, based on: activity domains, mental health dimensions, and individual characteristics. The mindful movement theory proposes an underlying mechanism that could explain the positive physical activity – mental health relationship, and the complexity paradigm provides basis for creating a workable definition for the concept of mindful physical activity.

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*“I recollect, years ago, reading a certain work by an American doctor on hygiene and the Laws of Life, and the type of future humanity. I remember well an awful prophecy that it contained about the future of our muscular system. The writer said: “Human perfection means ability to cope with the environment; but the environment will more and more require mental power from us, and less and less will ask for bare brute strength. Wars will cease, machines will do all our heavy work, and man will become more and more a mere director of Nature’s energies, and less and less an exorter of energy on his own account. So that, if the homo sapiens of the future can only digest his food and think, what need will he have of well-developed muscles at all?” I cannot believe that our*

*muscular vigour will ever be a superfluity. Even if the day ever dawns in which it will not be needed for fighting the old heavy battles against Nature, it will still always be needed to furnish the background of sanity, serenity, and cheerfulness to life, to give moral elasticity to our disposition, to round off the wiry edge of our fretfulness, and to make us good-humoured and easy of approach”.*

(William James, 1899, *The Gospel of Relaxation*, pp. 205–207)

### The broad frame

*Physical activity – health; health – mental health; physical activity – mental health*

In the “*Global Strategy on Diet, Physical Activity and Health*” (2004), the World Health Organization (WHO) acknowledged that regular, adequate physical activity (PA) is a public health priority,

\* Corresponding authors. Tel.: +32 498 563 309.

E-mail address: [aszmel@yahoo.com](mailto:aszmel@yahoo.com) (M. Asztalos).

and represents a “major factor in the promotion and maintenance of good health throughout the entire life course”, along with healthy diets. Shortly thereafter, the consensus report of the US Department of Health and Human Services and the Institute of Medicine (2006) broadcasted the conclusion that “distinct and independent focus on physical activity is imperative”. In the same line, the updated health recommendations for adults from the American College of Sports Medicine and the American Heart Association declared that “the greatest potential for increased health and reduced mortality is in taking on physical activity” (Haskell et al., 2007).

A firm science base on the health benefits of physical activity grew solid in the last decade and established the crucial position of PA in the promotion of health. On the other hand, per definition, health implies consideration for-, and proper recognition of the importance of mental health (MH): “health is a state of complete physical, mental, and social well-being, and not merely the absence of disease or infirmity” (WHO Constitution, 2006). Moreover, MH is a fundamental pillar of the overall well-being and the effective functioning of an individual and a community, that is: “a state of well-being in which the individual realizes his or her own abilities, can cope with the normal stresses of life, can work productively and fruitfully, and is able to make a contribution to his or her community (WHO, 2007). Furthermore, for utter accuracy, it is important to comprehend that MH “is a positive sense of well-being and an underlying belief in our own and others’ dignity and worth that reflects the emotional and spiritual resilience which enables us to enjoy life and to survive pain, disappointment, and sadness” (DoH, 2001). The accurate understanding of the complex meaning of MH allows accepting that “how well society functions depends on how people feel about themselves, as how society works at every level influences the way people feel” (Scottish Development Centre for Mental Health Services, 1999).

The strong impact that PA is shown to have on health (Bauman, 2004; Nocon et al., 2008; Warburton, Nicol, & Bredin, 2006), and the importance of MH in the very existence of health, incite the expectation that PA may have substantial impact on MH as well, and could thereby contribute to the making of a better functioning society. In support of this expectation, Fox (2000a, 2000b) emphasized the “natural partnership” between PA and MH, establishing four major roles that PA fulfils in MH promotion: 1.) as therapeutic means for existing MH problems; 2.) as means to improve quality of life in people with MH problems; 3.) as preventive measure for MH problems; and 4.) as means to improve the mental well-being of the general population. In the same line, multiple studies collectively show that PA results in positive MH benefits across several populations, and thus PA strikingly fulfils these four roles.

Hence, evidence indicated that PA instantly and on long-term improves mood, and significantly reduces symptoms of depression and anxiety (Biddle, 2000; Dunn, Trivedi, Kampert, Clark, & Chambliss, 2005; Landers, 1997; Penedo & Dahn, 2005). Individuals diagnosed with major depression undergoing PA interventions showed significant improvements in depression comparable to individuals receiving psychotropic treatment; moreover, individuals following PA programs had significantly lower relapse rates than individuals receiving medication (Penedo & Dahn, 2005). Further evidence indicated that PA improves health-related quality of life, enhances the experience of well-being, increases physical functioning, and it buffers age-related cognitive decline (Bauman, 2004; Bize, Johnson, & Plotnikoff, 2007; Fox, 1999; Vuillemin et al., 2005). In addition, PA helps improve the quality and the length of sleep in individuals who suffer from sleeping problems, and in those who do not (DoH, 2001), and adequate PA may reduce symptoms of panic disorders, along with greatly increasing

perceived energy levels, and enhancing self-esteem and positive affect in individuals suffering from MH problems (Fontaine, 2000). Besides, PA enhances social well-being in all populations, by producing social cohesion and a sense of belonging or affiliation (DoH, 2001). Finally, epidemiological evidence supports the role of PA in the prevention of MH problems, in stress management, and the improvement of MH in the general population (Berger, 1994; Biddle, Fox, & Boutcher, 2000; Dunn, Trivedi, & O’Neal, 2001; Morgan, 1997, pp. 58–60). A range of data on self-reported health status, stress level, fear of crime, and believing that unfamiliar others are untrustworthy, suggest that a considerable percentage of the population suffer from poor mental well-being, expressed as low self-esteem and feelings of worthlessness, frequently depressed mood, poor body image, lack of self-confidence, poor sleep quality, and social isolation (DoH, 2004). In the same line, mental illness in the form of depression is predicted to become the second most prevalent cause of disability worldwide by 2020 (WHO, 2001). In contrast, physically active individuals appear to feel better about themselves and consistently report higher levels of subjective well-being (DoH, 2004).

### A narrow issue within the broad frame

*Definitive policy decisions and investments in the area of physical activity – mental health are scarce*

As outlined above, current research is certainly indicative of a positive PA-MH relationship. However, definitive policy decisions and investments in this area require better prospective observational studies to examine the dose–response relationship between PA and MH, and larger randomized control trials to identify the dose and the type of activity required. Additionally, an urgent need exists to explore the underlying mechanisms for the observed MH benefits associated with PA (Bauman, 2004). In line with this state of art, currently PA endorsement meant for the promotion of MH is a rarity, and the amount and type of PA necessary for optimal MH are yet to be established, as PA recommendations only tangentially deal with the potential of PA for MH benefits.

The root of this gloomy reality is the fact that the existing evidence cannot certify a causal relationship between PA and positive MH outcomes. Thus, the current evidence is useful primarily in setting the stage for future (better) research that could more convincingly demonstrate that regular and adequate PA participation induces reduced risks of-, and solid recovery from-MH problems, as well as enhanced mental, emotional and overall well-being. The impediments preventing such research from being conducted are primarily ignorance and the subsequent lack of funds supporting powerful research in the domains exploring the PA-MH relationship, such as exercise psychology. In turn, the lack of such powerful research obstructs definitive policy decisions and investments in this area; therefore establishing a sad “catch 22” logical paradox, to which individual mental health and the health status of the human society fall prey.

Some exceptional scientists attempted to break through this dilemma and dared to “stick their necks out” in favour of more definitive statements, aligning with Landers (1997) who drew attention to the inordinate cautiousness of the scientific community when claiming the MH benefits derived from PA. A truly daring report in this sense was that of Nanette Mutrie (2000) concluding that “existing evidence strongly supports the view that PA protects against the development of depression”. Similarly, Nieman (2002) stated that “the MH benefits of PA are at least as important as its physical health benefits”. From a different perspective but in the same line, Jones and O’Beney (2004) elaborated on the high cost-effectiveness resulting from the consistent adaptation of PA in

MH promotion and MH treatments. As a consequence, influential institutions such as the World Health Organization, the United States Centers for Disease Control and Prevention, and the United Kingdom Department of Health (UK DoH) acknowledged that PA can be considered both for its preventive and its therapeutic effects on mental illness, and also for its impact on MH in the general population. Among these decision making organs however, only the UK DoH paid attention to the influence of PA on the individuals' perception of well-being, highlighting the fact that PA makes people "feel happier", "feel better about themselves", and it may improve mental functioning, by "acting as a buffering or coping strategy for psycho-social stress" (DoH, 2004).

Thus, the UK DoH report dedicated separate sections to MH benefits, detailing that positive changes following from PA were observed in overall physical self-worth and specific aspects of physical self-perceptions (e.g., body image, perceived fitness and strength), which seem to have a direct independent association with MH indicators. Changes in physical self-perceptions were accompanied by improvements in overall feelings of worth or general self-esteem to variable degrees, with stronger effects of PA manifesting in those with initially low self-esteem (e.g., special needs groups, adults with learning difficulties, depressed women, youth offenders, obese men, and problem drinkers) (Fox, 2000b; Spence & Poon, 1997; Van de Vliet et al., 2002). Further, active individuals report having fewer symptoms of anxiety and emotional distress than their inactive counterparts, as PA can help people feel less anxious in general (trait anxiety), and single exercise sessions can help individuals feel less anxious afterwards (state anxiety) (Hassmen, Koivula, & Uutela, 2000; Iwasaki, Zuzanek, & Mannell, 2001; Stephens, 1988; Steptoe & Butler, 1996). Specifically, moderate-intensity PA can reduce the short-term physiological reactions to brief psycho-social stressors (as demonstrated by systolic and diastolic blood pressure, galvanic skin response, muscle tension, or self-reported psychological symptoms), and it can help people recover more quickly from those stressors (Taylor, 2000).

## The broad frame of the present research

### *Introducing the concept of mindful movement*

We emphasize the scarce attention directed towards the potential of PA to enhance awareness of oneself and improve stress-related mental functioning, because -through this paper- we intend to present the theory that the PA-MH relationship may be centred on the relationship between PA and stress,<sup>1</sup> at the core of which we propose the concept of *mindful movement*, where the quality of PA is elevated by focussing it on the development of a specific level of self-awareness known as *mindfulness*. When PA takes the form of mindful movement, one consciously experiences the movements of one's body and is thereby deliberately present in the whole practice of PA, as if one becomes one's own observer. Through "whole practice" we mean that simultaneously with the act of moving one's body, one also breathes in certain ways, feels certain feelings, and thinks certain thoughts. The observation of these four elements -movement, breathing, feeling, and thinking- while engaging in PA, changes the quality of the exercise, turning it into mindful movement. We further posit that by regular participation in mindful movement, a new "true" sense of self can be experienced, that is the expression of a deep level of awareness called mindfulness. The concept of mindfulness was perfectly defined by Kirk Warren Brown, Richard M. Ryan, and J. David Creswell (2007a, 2007b) as

"an open, unbiased awareness of- and attention to inner experience and manifest action" which brings about "the possibility for unbiased information processing and consequently greater opportunities for adaptive self-regulation and well-being". As the exquisite work of Brown, Ryan, and Creswell demonstrates, placing mindfulness at the core of MH is a reasonable enterprise.

Our concept of mindful movement serves both the development of mindfulness in individuals who are dispositionally less mindful (state mindfulness), as well as the enhancement and refinement of mindfulness in dispositionally more mindful individuals (trait mindfulness) (Brown & Ryan, 2003). Specifically, through the practice of mindful movement, one trains oneself in experiencing "a self" who moves, breathes, feels, and thinks, while simultaneously one's "true self" observes the movements, the breathing, and the feelings and thoughts that are generated during PA. Through repeated experiencing of such "retreat" into one's true self (i.e., the observer), one may gather recognition of the "trueness" of this observer self, and can manage locating it apart from the self that moves and breathes, and produces different thoughts and feelings. This way, one may become aware that one's body and one's mind belong to one's true self, yet are not it. Similarly, one's feelings, thoughts, emotions, and problems, although may seem to belong temporarily to one's self, should never define- or become part of one's identity. In other words, mindful practice of PA (i.e., PA that involves mindful movement) may help individuals *not-identify* themselves with their feelings, thoughts, emotions, and problems, but watch them as an observer. This mindful practice allows for refreshed perspectives and detached views because a healthy distance is created between an individual's true self and his or her feelings, thoughts, emotions, and problems, which ultimately are the products of one's efforts to seek conformity with ego-based demands and goal states (Brown et al., 2007b). This process of dissociation provides place for awareness to manifest, and that awareness translates into mindfulness, which in turn is an essential element of sound MH.

This paper aims to contribute to the knowledge base on well-being enhancement and to open new avenues for application of the substantial work of Kirk Warren Brown and Richard M. Ryan, which showed that mindfulness is a reliably and validly measured characteristic that has a significant role to play in a variety of aspects of MH. We hypothesize that future research on the MH benefits of mindful movement would support the idea that by turning PA into mindful movement, its quality gets elevated and its potential for MH benefits gets maximized. Moreover, based on the evidence of the beneficial effects that mindfulness has upon MH, we further believe that encouraging mindful movement in the general public can be a cost-effective solution for the emotional distress plague hindering the MH of the contemporary society.

Nevertheless, since policy development on PA specifically targeting MH benefits is yet to be awaited, we understand that the hypotheses launched above are well ahead their time. However, we align with Brown et al. (2007b) in their conviction that "given the demonstrations of great potential for enhancing personal and social well-being, the challenges still ahead in mindfulness research, *make the journey all the more worthwhile*". Within mindfulness research, our concept of mindful movement finds its place in both the development and the application of mindfulness. Regarding the former, Brown, Ryan, and Creswell emphasized that "investigation of the supportive social and other conditions for the development of mindfulness as both a natural occurring and cultivated quality is needed". Regarding the latter, by turning PA into mindful practice of PA, a substantial boost of the benefits derived from PA is to be expected, because the definition of health conceptually justifies the expectation that the physical health

<sup>1</sup> Support for this proposition is presented in later sections.

benefits of PA will likely become more powerful when they are coupled with its MH benefits.

### The narrow frame of the present research

#### *The complexity of the physical activity – mental health relationship*

Nevertheless, as far as the present paper goes, we cannot stretch the boundaries of the original research presented here beyond the presentation of the mindful movement concept. Ultimately, this current work is intended to pave the path for future research in this area, aiming to establish the concept of mindful movement and subsequently to develop a workable definition for the construct of *mindful PA*. Through mindful PA, we understand on one hand, PA that includes mindful movement as described above, and on the other hand, PA that has maximized potential for MH benefits; hence, maximized capacity to enhance MH status. We believe that one important reason why no PA guidelines for MH benefits were developed yet is that currently it is not known what characteristics heighten the potential of PA for MH benefits.

This emphasizes a clear discrepancy between the relationships that PA has with MH and with physical health. While regarding the latter quite precise dose–response evidence is supplied (e.g., 2008 Physical Activity Guidelines for Americans), regarding the PA-MH relationship there is only consensus on the fact that this relationship deserves special attention (Biddle et al., 2000; Fox, 1999; Jones & O’Beney, 2004; Landers, 1997). In the same line, a need to produce a more differentiated picture about the PA-MH relationship was highlighted (Gauvin & Spence, 1996; Landers, 1997; Seraganian, 1993). In addition, a general disagreement exists regarding the mechanisms underlying the PA-MH relationship [e.g., the distraction hypothesis (Bahrke & Morgan, 1978), the self-efficacy theory (Bandura, 1977), the mastery hypothesis (Griest, Klein, Eischens, Gurman, & Morgan, 1979), the social interaction hypothesis (Ransford, 1982), the monoamine hypothesis (Ransford, 1982), and the endorphin hypothesis (Morgan, 1985)]. Our mindful movement concept relies on a deeper understanding of the previously proposed psychological mechanisms that might bring valuable contribution to an integrative model, which is believed to be required to adequately explain the PA-MH relationship, and which allegedly postulates the interplay of biological, psychological, and social factors (North, McCullagh, & Tran, 1990; Thirlaway & Benton, 1992).

The marked discrepancy between the relationships that PA has with MH and with physical health confirms the statement of Scully, Kremer, Meade, Graham, and Dudgeon (1998) that the relationship between PA and MH is much more complex than the relationship between PA and physical health. Hence, while a dose–response relationship has heuristic value relative to the physiology of PA, it fails to account for the cognitive and emotional experiences of the individual who performs the activity. We align with this statement of enhanced complexity, and, following a comprehensive literature search on the topic, we propose an algorithm of the complexity of the PA-MH relationship, including three coordinates on which this complexity manifests, based on: 1) PA domains, 2) dimensions of MH, and 3) individual characteristics. Specifically, the relationship between PA and MH likely varies depending on *activity variables* such as PA type or intensity, *psychological conditions* such as (di) stress, depression, or anxiety, and *individual characteristics* such as gender, age, or socio-economic status (SES). Simply put, different types and intensities of PA may associate with diverse psychological conditions in varied groups of individuals. Additionally, by exploring these three coordinates, a solid base can be created for the workable definition of mindful PA.

### Complexity of the physical activity – mental health relationship

#### *First coordinate – domains of activity such as type or intensity*

Findings from several studies support the supposed validity of the above proposed complexity algorithm. For instance, Asztalos, De Bourdeaudhuij, and Cardon (2009) found that the positive associations between PA and MH in men referred to vigorous-intensity PA and specific dimensions of MH such as feelings of depression and anxiety, and symptoms of somatisation, whereas in women, it referred to walking and moderate-intensity PA and both specific and general dimensions of MH such as symptoms of somatization and emotional well-being. In another study by Asztalos et al. (2008), among five types of PA (i.e., housework, active transportation, bicycling to and from work, walking to and from work, and participation in sports), “required” PA that was *utilitarian* in nature and *compulsory* to certain extents (e.g., housework) was either unrelated or negatively related to MH. On the other hand, “elective” PA, such as sports participation, was consistently positively associated with MH. The researchers reasoned that sports participation usually represents a chosen leisure-time activity, which aims for recreation, enjoyment and social interaction. These attributes are positively and significantly associated with MH (Fox, 1999; PCPFS, 1996), and they can rarely be attributed to types of PA that imply more or less compulsion, such as housework or active transportation to work. Hence, Asztalos et al. (2008) have proposed that although PA of any content may be beneficial for physical health, when targeting MH benefits, it might be insufficient to just climb the stairs instead of taking the elevator, or to engage in housework or gardening. In contrast, sports participation requires and facilitates more present moment focus and a more “whole” participation in PA (as opposed to -for instance- active transportation to work, in which the mind easily wanders off towards work-related issues, reducing the likeliness that the person would consciously participate in the act of movement). The present study continues our previous investigation in which sports participation, as opposed to other types of PA, was consistently associated with positive MH (Asztalos et al., 2008). In the same line, Stephens (1988) found that recreational PA, instead of household chores, was associated with MH benefits in four large population surveys. Similar were the findings of Hamer, Stamatakis, and Steptoe (2008): among different types of PA including housework, gardening, walking, and sports, the strongest associations with lower odds of psychological distress were for participation in sports. Based on this evidence, we propose that a first characteristic of mindful PA is that it entails some form of sports participation (i.e., it is PA done with the sole purpose of moving one’s body or for enjoyment).

This aspect was seldom researched further; hence, knowledge on the differential potential of various sports for MH benefits is very limited. One study by Berger and Owen (1988) compared four types of sports in their potential for mood benefits and found that *swimming* showed little effect on mood, *body conditioning* resulted in increased fatigue and no other mood effects, *Hatha Yoga* was from the first session a good method of reducing stress, and *fencing* resulted in more vigour although it was expected that this sport would not influence mood at all. In line with the above presented evidence, this study analyzes the relationship between participation in different types of sports and MH; more specifically, the relationship between sports participation and stress, given that the PA-MH relationship may be centred on the relationship between PA and stress. The section below provides support for this latter idea, while describing the construct of stress and its links with mindfulness.

## Complexity of the physical activity – mental health relationship

*Second coordinate – dimensions of mental health such as depression or anxiety and their central element – stress*

Stress is a main factor affecting emotional health, that is, individuals' capacities to hold control of their thoughts, feelings and behaviours, to feel good about themselves, and have good relationships, and to be able to keep problems in perspective (AAFP, 2002). Hence, stress often results in anxious, irritable, overly sensitive, tense, unfocused, or depressed individuals. Thus, stress and how people cope with it are key determinants of MH and the quality of life (Benson & Proctor, 1984; Plowman, 1994; Zeidner & Endler, 1996). In addition, Salmon (2001) proposed that PA as stress adaptation provides a theoretical framework for understanding the effects of PA on anxiety, depression, and resistance to stress; hence, understanding the way in which PA relates to stress may elucidate the complex PA-MH relationship.

On the other hand, stress is not one construct, but a complex system of interrelated processes (Gill, 1994), including the stressor, one's personality, and one's life experiences (Selye, 1985), and resulting in a complicated phenomenon that is likely indefinable (Lazarus, 1990). Hans Selye (1985) extended views on the stress process, positing that stress reflects "*the non-specific response of the body to any demand placed upon it to adapt, whether that demand produces pleasure or pain*". He advocated that "*complete freedom from stress is death*" because "*stress is the spice of life*", and he consequently stated that "*I cannot and should not be cured of stress, but merely taught to enjoy it*" (Selye, 1975). Thus, in contrast with some contemporary opinions that present stress as an utterly negative term [e.g., "*the number one public enemy*" (Todorov, Nadler, & Todorov, 2003)], Selye's position distinguished between the *good* and the *bad* stress (i.e., eustress vs. distress). Franks (1994) actualized this position by highlighting that most special experiences in an individual's life and most experiences fostering personal growth, which lead the individual towards higher levels of mental, social, or physical health, likely represent highly stressful peak moments.

Spielberger's (1989) sequence is a useful guide in the proper understanding of stress, and it begins with a stressor, followed by the perception and appraisal of the threat, ending with an elicited stress response. Spielberger (1989) argued that state anxiety is the most likely stress response, encompassing the *fight or flight* reaction (Cannon, 1914) and related responses. *State anxiety* is defined as an unpleasant emotional arousal in face of threatening demands or dangers. Therefore, it is distinct from *trait anxiety*, which reflects the existence of stable individual differences in the tendency to respond with state anxiety in the anticipation of threatening situations (Spielberger, 1983). At the level of both state and trait anxiety, Spielberger (1980) made a distinction between worry (i.e., the cognitive component of the anxiety experience that refers to worries about the imminent threat and the perceived lack of competence to counteract it) and *emotionality* (i.e., the perceived arousal component of the anxiety experience that refers to sweating, headaches, nervousness, and other bodily reactions). The two components are usually present simultaneously to some degree, but they differ in terms of their behavioural consequences: worry is negatively correlated with perceived self-efficacy, while emotionality is not (Schwarzer, 1996). This is why individuals who harbour worry and self-doubt are usually more anxious; and, since they do not feel competent to cope with challenging demands, their performance is likely impaired (Spielberger, 1980).

The view on stress was perfected by the Transactional model of Lazarus and Folkman (1984), in which the individual's perception "*I think I am stressed*" plays the central role. Here, the stress process

refers to a relationship between a person with certain characteristics and an environment (stressor) with certain characteristics; and this relationship is defined by the individual's *cognitive appraisal*, including appraisal of  *coping* capabilities (Lazarus, 1986). The process of cognitive appraisal is neither automatic nor simple, but it represents the "*heart*" of the complex stress process (Gill, 1994), because through cognitive appraisal the individual decides whether a stressor (and thus the stress process) is perceived as positive or negative. In other words, it depends on the individual's cognitive appraisal whether a demand for change is embraced as an opportunity, or perceived as a threat. Incorporated in Spielberger's (1989) original sequence, cognitive appraisal of the threat becomes a prerequisite for the experience of anxiety (state), and thus for the occurrence of emotionality, worry, and performance impairment. Consequently, the optimization of appraisals is essential for good MH and efficient functioning in life. In addition, appraisal is a perpetual process that evolves in time as the individual re-appraises the stressor (Lazarus & Folkman, 1984).

As noted above, cognitive appraisal extends also to appraisal of coping capabilities. Appraisals and coping are the two critical mediators of the person–environment relationship (i.e., the stress process) and their immediate and long-term outcomes (i.e., the stress responses). However, while cognitive appraisal is the process of categorizing an encounter, and its various facets, with respect to its significance for well-being, coping as a process involves some form of thought, action or feeling that is used, modified or eliminated to deal with an event eliciting some form of psychological stress. In other words, *appraisal* of threat is a function of a specific set of environmental conditions that are appraised by a particular person with certain psychological characteristics, while *coping* consists of particular thoughts and behaviours a person is using to manage the demands of a certain person–environment transaction, which is relevant to the person's well-being (Folkman, Lazarus, Gruen, & DeLongis, 1986). Hence, positive re-appraisal represents not only appraisal, but also a way of coping; and as such, it allows the placement of appraisal at the core of the stress process. On the other hand, given that mindfulness fosters successful self-regulation (Brown et al., 2007a, 2007b), it is reasonable to suppose the existence of a link between optimal appraisals and mindfulness. Consequently, our aim to add detail to the knowledge base on the relationship between PA and MH – central to which we considered the relationship between PA and stress – may be accomplished by focussing on the relationship between PA and stress appraisal. Subsequently, we also propose that a second characteristic of mindful PA is that it tackles stress appraisal.

As far as the relationship between PA and stress goes, so far it is only known that PA is likely a mediator between stress and health (or illness) (Gill, 1994), and that PA is associated with reduced psychological stress responses (Rejeski, Thompson, Brubaker, & Miller, 1992) and with decreased physiological responsiveness to physical and psycho-social stressors (Blumenthal et al., 1989; Dishman, 1994; Petronnet & Szabo, 1993; Rimmel, 2007), which is likely because PA results in psychological and physiological benefits that enable individuals to cope with stress more effectively (Berger, 1994; DoH, 2004; Fleshner, 2005; Taylor, 2000). Further, the role of PA in stress management was shown both corrective and preventive. Thus, compared to their non-active or less active counterparts, physically active individuals showed reduced reactivity to-, and faster recovery from stressors (Crews & Landers, 1987), reduced susceptibility to the adverse influences of life stress (Moses, Steptoe, Mathews, & Edwards, 1989; Throne, Bartholomew, Craig, & Farrar, 2000; Tucker, Cole, & Friedman, 1986), and less illness when experiencing many negative life events (Brown, 1991). Conversely, non-active or less active individuals were twice more likely to report high levels of stress than their active counterparts (Aldana, Sutton,

Jacobson, & Quirk, 1996). As elaborated in the previous section, from the perspective of MH benefits, it is sensible to focus on sports participation rather than on other “utilitarian” PA. The synthesis in this section specifies the MH component of the equation, suggesting that the investigation of the relationship between sports participation and stress appraisal may be a well-justified endeavour, which can deepen the understanding of the PA-MH relationship, simultaneously anchoring the concept of mindful PA.

### Complexity of the physical activity – mental health relationship

#### *Third coordinate – individual differences in physical activity and mental health*

The third coordinate in the proposed algorithm of the complex PA-MH relationship highlights individual characteristics. PA is not a homogenous and standardized experience, since different individuals' experiences of the same activity are subject to wide variations, and so are the effects of the activity (Bailey, 2005). Van Landuyt, Ekkekakis, Hall, and Petruzzello (2000) have argued that appreciation for the “*charm of variety*” (i.e., individual differences) has the potential to increase the complexity of conceptual models regarding the PA-MH relationship, improving their scientific quality, and ultimately enhancing the effectiveness of public health recommendations on PA. Nonetheless, despite the importance of individualization in PA, especially relative to MH, being evident, individualization at population level is not a feasible endeavour. Hence, considering essential differences between individuals, such as gender or socio-economic status (SES), might represent viable first steps towards respecting the distinctive qualities and needs of each individual. Before detailing about gender differences in PA and stress-related MH (and listing additional variations in PA and MH resulting from SES differences), the motivation underlying the individualization of PA relative to MH, as proposed in this study, must be clarified. This study does not aim to separate and categorize individuals, let alone to discriminate between women and men (or persons with high and low SES). Instead, the goal here is to soundly acknowledge and sensibly respect the special features of women and men, remembering that on a deeper level both are human beings who deserve good MH and can derive great benefits from *mindful PA*.

More specifically, our theory on mindful movement proposes that mindful PA can help individuals transcend the ego-based demands and goal states they place upon themselves, which induce internal struggles and distressful thoughts and feelings, preventing the “pure” or “lucid” awareness that reveals what is occurring, before or beyond *ideas* about what is or has taken place. As Brown et al. (2007a) further elaborate, this unbiased receptivity of mind is also thought to facilitate insight into reality, wherein phenomena that would otherwise remain hidden from view are “seen” or known with increasing clarity. In turn, this clarity is thought to facilitate unhindered access to all of one's relevant knowledge (e.g., intellectual, emotional, and physical/intuitive), which helps one in the constructive handling of one's life situations. Certain phenomena can remain hidden from conscious awareness because they represent threats to the self-concept or to aspects of self that are ego-invested. Based on this reality, therapeutic interventions which incorporate mindfulness training encourage certain non-judgemental attitudes towards experience, such as acceptance, which can facilitate direct contact with uncomfortable realities or experiences. This is thought to diminish impulsive or defensive reactions to unsettling experiences (Ryan, 2005), and to promote the development of insight into self, others, and the human condition (Brown et al., 2007a).

This insight corresponds precisely with the true self mentioned in the third section of the introduction, which outlined the mindful movement theory. In every individual, the true self is covered by layers of ego-based self, which -we posit- can be transcended through mindful PA because the practice of mindful movement triggers experiencing the observer (or retreating into the true self), which -in turn- helps recognizing the different layers of ego-based self, and allows awareness to be revealed. The recognition of the different layers of the ego-based self requires knowledge about their characteristics which differ from one individual to another; hence, substantiating the need for individualization in mindful PA. Accordingly, we propose as the third characteristic of mindful PA that it is as much as possible individualized. Although focussing on gender differences represents a rough categorization of the layers of ego-based self, such focus can be a beneficial first step and it certainly confers advantages qua feasibility. In addition, gender differences are particularly intriguing in the PA-MH relationship, as gender is an important factor in both PA and MH.

Previous findings suggest that different PA might associate with MH in women and in men (Anderson, Broom, & Pooley, 1995; Bouchard, Blair, & Haskell, 2007, pp. 247–259; Home, 1994; Stephens, 1988; Wiest & Lyle, 1997). Specifically, the likeliness of MH benefits following from activities of higher intensity could be greater in men than in women (Asztalos et al., 2009; Brown et al., 1995; Sandlund & Norlander, 2000), while the likeliness of MH benefits following from walking, or milder activities including a cognitive component could be greater in women than in men (Asztalos et al., 2008, 2009; Brown et al., 1995; Ransford & Bartolomeo, 1996; Sandlund & Norlander, 2000). In their study examining mood alterations after Hatha Yoga and swimming, Berger and Owen (1992) found that women obtained fairly equal MH benefits from both sports, while men experienced greater decreases in tension, fatigue, and anger after Hatha Yoga than after swimming. Furthermore, men who personally selected participation in Hatha Yoga obtained the greatest MH benefits. A few authors have also made some gender specific observations regarding the sport participation-MH relationship. For example, Tharion, Harman, Kraemer, and Rauch (1991) found that men tend to respond better in terms of mood states to weight lifting than women, while Collins (1994) emphasized that weight lifting may be somewhat boring, not to mention extremely fatiguing, and perhaps a different type of sport is needed for achieving MH benefits in women. Some authors considered that resistance training could have a beneficial effect on MH because of the relatively immediate effect of body perception, which promotes self-concept and self-efficacy, but they have also suggested that sports such as walking, gentle jogging, cycling, swimming, or dance, and group recreational sports (e.g., ball games) may be the most appropriate and effective PA for MH promotion (DoH, 2004; Fox, 2000a; Larun, Nordheim, Ekeland, Hagen, & Heian, 2007). In addition, Ransford and Bartolomeo (1996) found that women are significantly more likely to report MH benefits when they engage in walking for exercise than men, and this finding was further supported by Asztalos et al. (2009). Finally, in the study of Brown et al. (1995), women experienced reductions in mood disturbance and improvements in general mood after a mild-intensity PA that included some cognitive elements (i.e., Tai Chi), whereas men reported increased positive affect following more intense PA that had no cognitive elements (i.e., brisk walking 65–75% of maximum heart rate).

Gender differences are important from the perspective of stress-related MH as well, because stress is different for every individual, even within the same situation. Consequently, applying universal strategies to all is not desirable because the complexity of the process makes universal principles virtually impossible (Gill, 1994).

As with PA, addressing stress individually is unlikely feasible; however, an important first step in the individualization of stress, which is not only doable but according to some researchers also “a must” (Barnett, Biener, & Baruch, 1987), is addressing stress with appreciation for gender differences. Most likely, women and men experience and express their emotions differently; hence, they likely perceive, appraise, and cope with stress differently. Generally, women seem to perceive more stress, and use more emotion-focused or *expressive* coping strategies than men, whereas men appear to manifest more emotional inhibition and use more problem-focused or *instrumental* coping strategies along with avoidance or escapism than women (Brody, 2000; Bursleson, 2003; Gross & John, 2003; Matud, 2004; Rosenfield, 1999; WHO, 2009). The “*Tend and Befriend Theory*” introduced by Taylor et al. (2000) contends that additional options for stress responses are available to women in the form of affiliative activities that may serve tending needs (i.e., protective responses towards offspring or others) and/or may take the form of befriending (i.e., seeking social contact for one’s own protection and solace). Taylor et al. (2000) posited that this connectedness, also known as “*nesting and nurturing*”, is hardwired in women’s DNA, and revealed through hormones (primarily oxytocin). Hence, women are more likely to portray a tend-and-befriend response to stress, whereas men are more likely to portray a fight-or-flight response to stress (Turton & Campbell, 2005).

Although the present study did not focus particularly on SES differences, it is important to acknowledge that SES adds further variation to the complex PA-MH relationship from the perspective of individual characteristics. SES is an important factor in both PA and MH. First, higher SES is generally associated with a higher prevalence of reporting being physically active. For example, 34.2% of American women and 35.5% of American men who had not graduated from high school were physically active, as opposed to 49.1% of women and 52.6% of men who were college graduates (CDCP, 2007). Higher SES was also associated with a significantly lower level of sedentary lifestyle among European women and men (Varo et al., 2003). This may relate to observations suggesting that high SES individuals may be more health conscious than low SES individuals, manifesting more interest in learning and adopting healthy behaviours, and also more determined for shunning unhealthy behaviours. Similarly, high SES individuals seem to care more to initiate, complete, and maintain positive behaviour changes (Hudson, 2005). These differences, however, are not meant to underline some sort of “*character flaws*” in low SES individuals; unfortunately, social inequalities in PA and health are undeniable facts. On the other hand, increases in SES are generally associated with improvements in MH, likely because SES influences directly rates of mental illness, and indirectly MH through the impact of economic hardship on low and middle income groups. Lower SES is reliably associated with a number of important social and environmental conditions that contribute to the chronic stress burden (e.g., crowding, crime, noise pollution, discrimination, and other hazards or stressors), and this chronic stress may capture much of the variance in health (and social) outcomes associated with the harmful aspects of lower SES. Hence, low SES is generally associated with distress, prevalence of MH problems, and with health-impairing behaviours that are also related to stress (Baum, Garofalo, & Yali, 1999). Thus, the direct “consequences” of high SES, such as the privileges of more and better resources and accessibility for both PA and MH care, cannot be neglected. Nevertheless, it is also important to note that high SES individuals may be harmed more by stress and the lack of PA than low SES individuals, because, due to their greater potential for good health, they have the most to lose from damaging behaviours and lifestyles (Pampel & Rogers, 2004).

## Research questions and hypotheses

In order to take the investigation of the relationship between PA and MH one step further, we proposed a theory on mindful movement, and a paradigm for the complexity of the PA-MH relationship, from which a workable definition for mindful PA (i.e., PA with maximized potential for MH benefits) was initiated, according to which mindful PA entails sports participation that is as much as possible individualized and tackles stress appraisal. A previous investigation in a larger set of the same sample (Asztalos et al., 2008) showed that sports participation was the single type of PA that was consistently associated with good MH. Based on these findings, which were supported by other authors (e.g., Hamer et al., 2008), the first characteristic of mindful PA was proposed: that it should have no utilitarian purpose, but instead aim for moving one’s body for enjoyment. The second characteristic regarded a need to tackle stress appraisal and this was based on our and other author’s (e.g., Salmon, 2001) position that the PA-MH relationship may be centred on the relationship between PA and stress. As we elaborated, optimal cognitive appraisals of stress can be viewed as manifestations of mindfulness. The third characteristic of mindful PA was to be as individualized as possible, in order to help recognizing and transcending the different layers of ego-based self, which were roughly grouped under the blanket of gender differences. Combining all these factors, the present study examined associations between participation in different types of sports personally favoured by the participants and stress appraisal and the stress response of emotional distress among women and men. Basic questions that the study aimed to answer were:

- Is there sport-type related variation in the PA-MH relationship?*
- How does participation in different types of preferred sports associate with stress appraisal and emotional distress in women and in men?*
- Are some types of sports, personally chosen by either women or men, particularly interesting in the PA-MH relationship?*
- Which layers of ego-based self can be identified in women and in men that could be transcended by practising mindful PA?*

In addition, the broader objective of the study was to inspire and support future research that could help strengthening statements about the PA-MH relationship while building the empirical knowledge base for preventive measures and MH promotion.

## Method

### Participants

The Flemish Policy Research Centre Sport, Physical Activity, and Health (SPAH), set up by the Flemish Government in 2002, collected data for this study. One of the main purposes of SPAH was to investigate the actual patterns of PA, SP, physical fitness, and general health, among the adult population of Flanders (the Northern half of Belgium). Between October 2002 and February 2004, SPAH collected data for a large epidemiological study, enrolling 46 Flemish municipalities. The Belgian National Institute of Statistics randomly selected nearly 18,500 adults aged 18–75 years within these 46 municipalities, who were contacted by trained interviewers via letter and telephone respectively and invited to participate in the study. Given the context of a large epidemiological study, a rather comprehensive test battery was employed, including questionnaires and physical measurements of anthropometric, fitness, and health parameters. Probably this was the underlying reason why only 28% of all contacted adults volunteered to participate in the SPAH epidemiological study

( $N = 5170$ ). Main reasons for not participating in the study among the non-responders were lack of time (25.9%), health problems (23.2%), work obligations (14.6%), previous engagements (14.1%), and other reasons (22.2%). Matton et al. (2007) compared the final sample to the total Flemish adult population and found it satisfactorily representative for geographic distribution, age, gender, and educational level.

Adults aged 20–65 years with complete data for the analyses participated in the present study. Students and retired people were excluded because the study focused on the stress-related aspects of young adulthood (e.g., building a career, settling down, raising children, learning to be an individual yet be part of a family) and mid-aged adulthood (e.g., mid-life crises, reassessing previous life structures with an eye to making revisions “while there is still time”) (Huyck, 1993). These adult years are probably the most active years in an average lifetime, which, on one hand, foster major life changes and events that represent stressful experiences, and, on the other hand, provide plentiful opportunities for personal growth and development of resilience against stress-related MH problems. Hence, it is likely during this lifetime period that individuals develop into healthier, stronger, more self-aware, and thus harmonious human beings, or that they settle into their weaknesses (Franks, 1994). This paper focuses on the potential of PA for MH benefits, especially regarding the stress-related aspects of appraisal and negative stress response. In other words, the potential of PA (more precisely that of participation in personally chosen sports) to bounce the balance towards becoming harmonious human beings, as opposed to weak and (di)stressed individuals, is addressed. Hence, this particular sample fit best the purpose of the study.

Consequently, the present study included 1427 adults, aged 20–65 years, 783 sport participator men (54.9%) and 644 sport participator women (45.1%). A description of the sample by gender and SES is shown in Table 3. An essential aspect of the sports participator status of the individuals in the sample is that all women and men have participated in their personally favoured type of sport. Within the sample of sport participators, equal percentages of women and men have reported membership in a sport club (i.e., 45%), but this was not inclusion criteria. Similarly, participation in competition was not exclusion criteria; however, the interpretation of the results was considerate of the fact that 9% of women and 22% of men reported participation in competition. Half of all competing men preferred ball games. Racket games and running were each chosen by 11% of competing

men. Ball games and racket games gathered the most competing women (34% each).

All members of the sample signed an informed consent statement for participation, and the Ghent University Ethics Committee approved the study.

### Measures and design

In a municipal centre in their neighbourhood, participants have completed self-report computerized questionnaires in the presence of a scientific staff member. The Flemish Physical Activity Computerized Questionnaire (FPACQ) covered demographics and PA. The FPACQ was developed within the framework of the Flemish Policy Research Centre SPAH with the objective to assess detailed information on several dimensions of PA and sedentary behaviour over a usual week. Matton et al. (2007) showed that the FPACQ is a reliable and reasonably valid questionnaire for the assessment of different dimensions of PA and sedentary behaviour in employed and unemployed adults (i.e., not retired), with good to excellent 2-week test-retest reliability for several activity variables calculated from the FPACQ (intraclass correlations (ICCs) ranging from 0.67 to 0.99). Demographic data derived from the FPACQ included gender, age, and SES. A comprehensive question in the FPACQ asked participants to select their favourite type of sport out of a list of 196 sports. The question showed each sport as a separate entry that was coded such that sports with related contents corresponded to the same number or to consecutive numbers (e.g., from 43 to 49 all numbers corresponded to some form of dance). After establishing which types of sports were favoured by the participants, 19 categories of sport-types were established by grouping sports according to their content, as shown in Table 1. Based on the 19 sport-type categories, 19 sport variables were created with two levels each, by coding with “1” all participants favouring a sport, while coding with “0” all other participants. For example, the variable *Dance* entailed one level -coded “1”- with all participants whose favourite was some form of dance, and a second level -coded “0”- with all other participants. The coding procedure was successively repeated until all participants had their share of being coded with “1”. From the 19 sport variables, only the ones that gathered at least ten participants coded with “1” were included in the analyses, in order to avoid statistical power problems. Exact numbers of participants corresponding to each type of sports, distributed across gender and SES groups, are presented in Tables 1 and 2, along with Chi-square

**Table 1**  
Description of 19 sport-type categories, numbers of participants who favoured each of them, and Chi-square values denoting gender differences in sport-types.

Types of sports	Total sample $N = 1427$	Women $N = 644$	Men $N = 783$	Chi-square gender
Biking (bicycling as relaxation, mountain biking, BMX-biking, road biking, track biking)	312	95	217	47.70 <sup>a</sup>
Running (jogging, running <5 km, running >5 km, orientation min. 5 km)	172	80	92	0.83
Fitness (general condition training, aerobics, fitness spinning)	162	107	55	16.69 <sup>a</sup>
Ball games (football, volleyball, basketball, korfbal, rugby, American football, bouncing, power ball)	156	30	126	59.07 <sup>a</sup>
Racket games (tennis, squash, badminton, table tennis)	142	65	77	1.01 <sup>a</sup>
Walking (regular walking for relaxation, nature walking, trekking poles, brisk walking with fit-o-meter)	140	81	59	3.45
Water sports (swimming in a pool, swimming in the sea, aqua jogging, aqua aerobics, aqua fitness)	104	70	34	12.46 <sup>a</sup>
Athletics (marathon, triathlon, track running, field running, 800–1500 fond, 5000–10,000 fond)	45	11	34	11.75 <sup>a</sup>
Dance (ballet, jazz, modern, standard, country, folk, Latino, African)	41	38	3	29.87 <sup>a</sup>
Gymnastics (tumbling, callanetics, artistic gymnastics, apparatus gymnastics, rhythmic gymnastics)	27	24	3	16.33 <sup>a</sup>
Horse sports (horse riding, jumping riding, carriage riding, horse breaking)	24	7	17	4.16 <sup>a</sup>
Martial arts (aikido, karate, jiu-jitsu, kendo, tae kwon do, judo)	20	5	15	5.01 <sup>a</sup>
Folk games (billiard, darts, bowling, snooker, pentaque)	20	3	17	9.80 <sup>a</sup>
Sliding sports (free-style skiing, cross-country skiing, skating, speed skating, ice-hockey)	20	10	10	0.00
Meditation sports (Yoga, Tai Chi)	16	13	3	6.25 <sup>a</sup>
Golf and Fishing (golfing, fishing in river, fishing in sea)	11	3	8	2.27
Outdoor sports (canoeing, rowing, parasailing, sailing)	7	1	6	3.57
Shooting sports (bow shooting, sharp shooting, hunting)	4	–	4	–
Motor sports (carting, motor cross)	4	1	3	1.00

<sup>a</sup> Significant gender difference within the sport-type.



**Table 2**  
Numbers of participants, with different types of sports as their favourites, distributed across gender and socio-economic status (SES) groups, and Chi-square values denoting SES differences in sport-types.

TYPES of Sports	Women			Men			Chi-square SES
	Un-employed	Blue-collar	White-collar	Un-employed	Blue-collar	White-collar	
Biking	19	22	54	12	66	139	129.86 <sup>a</sup>
Running	5	10	65	1	15	76	186.29 <sup>a</sup>
Fitness	12	16	79	4	13	38	111.81 <sup>a</sup>
Ball games	1	5	24	6	36	84	101.57 <sup>a</sup>
Racket games	13	4	48	1	20	56	102.81 <sup>a</sup>
Walking	22	15	44	5	12	42	49.72 <sup>a</sup>
Water sports	10	9	51	–	8	26	78.25 <sup>a</sup>
Athletics	1	2	8	–	16	18	21.73 <sup>a</sup>
Dance	5	7	26	1	–	2	22.58 <sup>a</sup>
Gymnastics	4	2	18	–	1	2	20.22 <sup>a</sup>
Horse sports	–	2	5	–	8	9	0.67
Martial arts	1	–	4	1	4	10	12.40 <sup>a</sup>
Folk games	1	–	2	2	6	9	4.90
Sliding sports	1	1	8	–	4	6	13.30 <sup>a</sup>
Meditation sports	4	1	8	–	2	1	3.87
Golf and Fishing	1	–	2	1	4	3	1.27
Outdoor sports	–	–	1	–	1	5	3.57
Shooting sports	–	–	–	–	2	2	0.00
Motor sports	–	–	1	–	3	–	1.00
Total	100	96	448	34	221	528	

<sup>a</sup> Significant SES difference within the sport-type.

values showing gender and SES differences within each sport-type. Types of sports that were excluded from the analyses are presented in lighter colour. In addition, the FPACQ supplied data on the frequency and duration of SP, which were included in the analyses as covariates and are presented in the Results section.

Two MH measures were used in this study, the Perceived Stress Scale (PSS) and the General Health Questionnaire (GHQ). The PSS is one of the most frequently used psychological tools to measure life stress, that is, the degree to which situations in one's life are appraised as stressful (Cohen, Kamarck, & Mermelstein, 1983). The PSS is a unique scale that fitted ideally the purpose of this study because it focuses on the cognitive appraisal of stress and on the respondent's perceived control and coping capability. The underlying philosophy of the PSS posits that stress – as opposed to challenge – results from experienced overload, with further emphasis on experienced unpredictability and uncontrollability of events. This implies that the existence of stress in a person is partly inferred from information on the person's experience of lack of

control. The non-specific content of the PSS items reflects this philosophy; hence, two items directly address “stress” or “hassles”, three items refer to situations of overload, and nine items refer to uncontrollable, unmanageable, or unpredictable situations. Even though it was developed almost three decades ago, the PSS proves itself to be a valid, reliable and comprehensive global measure of stress, as intended by its developers (Leung, Lam, & Chan, 2010).

The ten-question form of the PSS, which was used in this study, asks respondents about their feelings and thoughts in the last month. In each case, respondents are asked how often they felt a certain way (e.g., In the last month, how often have you felt confident about your ability to handle your personal problems? or In the last month, how often have you found that you could not cope with all the things that you had to do?). Answer categories are on a 5-point Likert scale (e.g., for the negatively stated items: 0 = never, 1 = almost never, 2 = sometimes, 3 = fairly often, 4 = very often); hence, the theoretical range of the scale is from 0 to 40. The computerized version of the scale that was utilized in the present study had excellent test-retest reliability, with an intraclass correlation coefficient (ICC) of 0.87, and a fair to good internal consistency (Cronbach's  $\alpha = .79$ ) (Wijndaele, Matton, Duvigneaud, Lefevre, Duquet, 2007). PSS total scores were obtained by reversing responses to the four positively stated items (e.g., *In the last month, how often have you felt that things were going your way? or In the last month, how often have you been able to control irritations in your life?*) and then summing across all scale items. PSS total scores represent the balance between perceived danger and perceived competence, which can be positive or negative depending on the quality of one's appraisals, which, in turn, depends on one's personality, emotions, and life experiences (Lazarus & Folkman, 1984). A positive balance between perceived danger and perceived competence (i.e., optimal appraisals) corresponds thus to lower PSS scores.

Cohen and Williamson (1988) found correlations between PSS scores and stress measures, health behaviour measures, and self-reported health. Higher PSS scores were associated with greater vulnerability to stressful-life-event-elicited depressive symptoms. Nonetheless, Cohen et al. (1983) have highlighted that despite its correlation with depressive symptoms, PSS measures a different and independently predictive construct. Hence, within the context of the present study, the variable *Stress Appraisal* refers to the possibility

**Table 3**  
Mean PSS and GHQ12 scores and corresponding standard deviations across gender and socio-economic status (SES) groups. Asterisks mark significant differences.

Description of the sample by gender and SES	N	Stress appraisal PSS		Emotional distress GHQ	
		M	S.D.	M	S.D.
<b>Total sample</b>	<b>1427</b>	<b>11.6</b>	<b>5.81</b>	<b>1.74</b>	<b>2.58</b>
Unemployed	134	11.8	5.7	1.71	2.7
Blue-collar-jobs	317	11.95	5.64	1.45	2.31
White-collar jobs	976	11.47	5.87	1.84	2.65
<b>Men</b>	<b>783</b>	<b>10.85<sup>a</sup></b>	<b>5.58</b>	<b>1.69</b>	<b>2.5</b>
Unemployed men	34	10.0	5.36	2.29 <sup>b</sup>	2.95
Blue-collar job men	221	11.12	5.36	1.27 <sup>b</sup>	2.09
White-collar job men	528	10.79	5.68	1.82 <sup>b</sup>	2.6
<b>Women</b>	<b>644</b>	<b>12.53<sup>a</sup></b>	<b>5.95</b>	<b>1.8</b>	<b>2.69</b>
Unemployed women	100	12.42	5.7	1.51	2.59
Blue-collar job women	96	13.86	5.84	1.83	2.74
White-collar job women	448	12.27	6.0	1.86	2.7

<sup>a</sup> Mean PSS scores in men significantly different than in women ( $F = 30.3$ ;  $p < .0001$ ).

<sup>b</sup> Mean GHQ scores in unemployed men significantly different than in men with blue-collar jobs, and mean GHQ scores in men with blue-collar jobs significantly different than in men with white-collar jobs ( $F = 4.72$ ;  $p < .01$ ).

that sport participation might alter the appraisal of stressful life events or encounters with the environment, as opposed to altering the process by which appraised stress results in MH problems.

The second MH measure used in this study, the GHQ, is a well-established psychological screening instrument, originally devised by Goldberg (1972) for detecting psychiatric disorder in the general population and within diverse community- or non-psychiatric clinical settings. The GHQ assesses the respondents' current state and asks if that differs from their usual state. Thus, the GHQ focuses on two major areas – the inability to carry out normal functions, and the appearance of new and distressing psychological phenomena. Since its original development, the GHQ has been widely acknowledged as a valid and reliable measure of mental well-being in the general population, and its status as a quality psychological tool is still genuine today. Hence, the GHQ is extensively used in the general population, in diverse settings (e.g., Donath, 2001; Jacob, Bhugra, & Mann, 1997; Lok et al., 2004; Montazeri et al., 2003; Schmitz, Kruse, & Tress, 1999).

In the present study, the 12-item version was used because it is quick to administer and has comparable psychometric properties to the longer versions of the GHQ. The twelve questions in the GHQ12 ask about respondents' recent experiences, feelings, and thoughts (e.g., *Have you recently been able to concentrate on whatever you were doing? or Have you recently been able to enjoy your normal day-to-day activities? or Have you recently been thinking of yourself as a worthless person?*). Answers categories are on a 4-point response scale, and in the present study the bimodal scoring method was applied, as advised by Goldberg and Williams (1988), with a theoretical range from 0 to 12 (e.g., for the negatively stated items: 0 = not at all, 0 = same as usual, 1 = more than usual, and 1 = much more than usual). The computerized version of the questionnaire that was utilized in this study had excellent test-retest reliability (ICC = 0.76) and a fair to good internal consistency (Cronbach's  $\alpha = .79$ ) (Wijndaele, Matton, Duvigneaud, Lefevre, Duquet, 2007). GHQ12 total scores were obtained by reversing responses to the six positively stated items (e.g., *Have you recently felt that you were playing a useful part in things? or Have you recently been feeling reasonably happy, all things considered?*), and then summing across all items. Suggested optimal cut-off points for GHQ12 total scores are 3 or 4 to indicate the likelihood of psychological distress or emotional disorders (Holi, Martunnen, & Aalberg, 2003). Worth noted however that proper psychological diagnostic cannot be based solely on GHQ scores. In the present study, the variable *Emotional Distress* reflected the stress response of emotional distress, that is, a lack in the global emotional health of participants.

The present study employed a cross-sectional design for assessing which types of sports (if any) are meaningful in relation to stress appraisal and emotional distress (or both) among women and men. It was outside the scope and beyond the resources of the present study to identify sports that most likely result in less emotional distress or mental disorders. The instruments utilized here cannot be considered diagnostic tools, and the cross-sectional data does not allow establishment of the direction of causality in the associations.

### Statistical analysis

Multiple MANOVAs were conducted separately in women and in men, using SPSS 15, with PSS and GHQ total scores as dependent variables, with a total of 15 sport variables alternating as independent variables, and with age, SES, club membership, frequency and duration of sport participation as covariates. Effect sizes (Cohen's  $d$ ) were calculated for each sport variable separately in women and in men, by calculating the difference in mean PSS and GHQ scores between the participants who chose one type of sport compared to the rest of participants who chose any other sports, and then dividing this value by the difference in corresponding standard deviations (Cohen, 1988). The relative size of Cohen's  $d$  translated into a negligible effect for values between  $-0.15$  and  $0.15$ , a small effect for values between  $0.15$  and  $0.40$ , a medium effect for values between  $0.40$  and  $0.75$ , a large effect for values between  $0.75$  and  $1.10$ , a very large effect for values between  $1.10$  and  $1.45$ , and a huge effect for values greater than  $1.45$  (Cohen, 1988).

### Results

As expected based on the literature showing that higher SES relates to higher prevalence of being physically active (CDCP, 2007; Varo et al., 2003), the majority of participants belonged to the high SES (white-collar job) category. This is shown in Table 3, which also presents mean PSS and GHQ scores and corresponding standard deviations, distributed per gender and SES groups. Lower PSS scores denoted optimal cognitive appraisals of stress, while lower GHQ scores indicated less self-reported emotional distress or good emotional health. The correlation between the two MH variables was positive and significant ( $p < .01$ ; *Pearson's r* = 0.551 in women, *Pearson's r* = 0.536 in men). 12 types of sports were compared among each other in their relation to appraisal of life stress and to emotional distress. Women reported participating in their favourite sport for a mean duration of 2 h/week; while men reported participating in their favourite sport for a mean duration of 3½ h/week. Participants reported the frequency of sport participation as shown in Table 4.

Significant gender differences existed in mean PSS scores, with women perceiving significantly more stress than men (Table 3). As established in the Method section, the significantly higher PSS scores reported by women denote a negative balance between perceived danger and perceived competence; hence, below optimal appraisals. Further, significant SES differences manifested among men with regard to emotional distress, with lowest GHQ scores in men with blue-collar jobs, and highest GHQ scores in unemployed men (Table 3).

The central finding revealed by the results was that sport-type related differences relative to stress appraisal and emotional distress were scarce. In the light of the fact that sports participation with no sport-type related differentiation was associated with significantly less stress and distress (OR = 0.970; 95%CI: 0.950–0.991), this finding shows that sport-type related

**Table 4**

Percentages of participants showing the frequency of their sports participation, distributed per gender and socio-economic status.

Frequency of sports participation	Women			Men		
	Un-employed	Blue-collar	White-collar	Un-employed	Blue-collar	White-collar
Less than monthly	5%	9.3%	7.1%	3%	10%	5.5%
Monthly (1–3 times per month)	5%	11.4%	10.9%	8.8%	12.6%	13%
Once per week	31%	42.7%	41.5%	26.5%	24.9%	32.6%
Twice per week	21%	18.8%	24.6%	20.6%	29.4%	25.6%
At least three times per week	38%	17.8%	15.9%	41.1%	23.1%	23.3%

differences in the PA-MH relationship are insignificant as long as individuals engage in personally favoured types of sports.

Further, while statistically the data was not overwhelming, the findings suggest that women who perceived higher levels of stress (hence, appraised more encounters with the environment as stressful), and those who reported more emotional distress, enjoyed walking and meditation sports. Whereas men who reported more emotional distress, enjoyed water sports and men who reported less emotional distress tend to favour ball games. Thus, as shown in Table 5, two types of sports were prominent relative to *stress appraisal* among women: *walking* (represented by 14% walking with trekking poles, 4% nature walking, and 82% regular walking), and *meditation sports* (represented by 85% Yoga, and 15% Tai Chi). Women who chose walking as their favourite sport scored significantly higher on the stress appraisal measure (PSS) than the rest of the sport participator women ( $M = 13.85$ ;  $S.D. = 6.69$ ;  $F = 5.528$ ;  $p < .05$ ; Cohen's  $d = 0.25$ ). The size of the effect attributable to participation in walking was small. Similarly, women who chose meditation sports as their favourite had significantly higher PSS scores than the rest of the sport participator women ( $M = 16.0$ ;  $S.D. = 6.83$ ;  $F = 4.195$ ;  $p < .05$ ; Cohen's  $d = 0.59$ ). The size of the effect attributable to participation in meditation sports was medium. In addition, meditation sports were also prominent relative to *emotional distress*. Women who favoured Yoga or Tai Chi had higher GHQ scores than the rest of the sport participator women ( $M = 3.58$ ;  $S.D. = 4.14$ ;  $F = 5.789$ ;  $p < .05$ ; Cohen's  $d = 0.68$ ), and a medium size effect was attributable to this association.

As shown in Table 6, other two types of sports “stood out” from the rest relative to *emotional distress* among men: *water sports* (represented by 80% swimming in pool, 3% swimming in sea, and 17% aqua jogging), and *ball games* (represented by 69% football, 26% volleyball, and 5% basketball). Men who chose water sports as their favourite had significantly higher GHQ scores than the rest of the sport participator men ( $M = 2.79$ ;  $S.D. = 3.26$ ;  $F = 6.709$ ;  $p < .05$ ; Cohen's  $d = 0.46$ ). The size of the effect attributable to participation in water sports was medium. Finally, men who chose ball games as their favourite reported significantly less emotional distress (i.e., lower GHQ scores) than the rest of the sport participator men ( $M = 1.26$ ;  $S.D. = 1.88$ ;  $F = 6.083$ ;  $p < .05$ ; Cohen's  $d = 0.2$ ), even though the size of the effect attributable to this association was small.

## Discussion

A sample of 1427 Flemish adults, aged 20–65 years participated in this study, including 783 sport participator men and 644 sport participator women. A previous investigation including a larger set of this sample (Asztalos et al., 2008) has already shown that sport

participation was the most interesting type of PA from the perspective of MH benefits. Continuing that work, this study aimed to analyze sport-type related variations in the PA-MH relationship, on the basis of our theory on mindful movement, and within the frame of a paradigm of the complexity of the PA-MH relationship that identified three coordinates on which the PA-MH complexity unravels, based on: PA domains, MH dimensions, and individual characteristics. The mindful movement theory proposes an underlying mechanism that could explain the positive PA-MH relationship, and the complexity paradigm provides basis for creating a workable definition for the concept of mindful PA (i.e., the PA with maximized potential for MH benefits).

Regarding the first coordinate, our previous investigation, in line with other findings (e.g., Hamer et al., 2008) narrowed the spectrum of PA domains down to sport participation. Regarding the second coordinate, our position on the central role that stress management plays in MH aligned with Salmon's (2001) unifying theory on how the PA-stress relationship can elucidate the PA-MH relationship, and this narrowed the spectrum of MH domains down to stress, and most importantly stress appraisal – the essence of the stress process. The third coordinate of the complexity paradigm highlighted the need for individualization in the PA-MH relationship. Here, two aspects were important. On one hand, the women and the men in the study participated in their personally favoured types of sports; hence, their PA could be considered neatly individualized. On the other hand, from the point of view of mindful movement, the present study focuses on fundamental gender differences, in order to identify layers of ego-based self, which -we posit- can be transcended through mindful PA because the practice of mindful movement triggers experiencing the observer (or retreating into the true self), which -in turn- helps recognizing these layers of the ego-based self, and allows awareness to be revealed.

Concretely, the study investigated associations of participation in 12 types of personally favoured sports with stress appraisal and the stress response of emotional distress among women and men. By careful analysis of the findings, we aimed to understand the finest details in the PA-MH relationship, and answer the following questions:

*Is there sport-type related variation in the PA-MH relationship?  
How does participation in different types of preferred sports associate with stress appraisal and emotional distress in women and in men?*

*Are some types of sports, personally chosen by either women or men, particularly interesting in the PA-MH relationship?*

*Which layers of ego-based self can be identified in women and in men that could be transcended by practising mindful PA?*

**Table 5**  
Results of MANOVAs assessing the relationship between twelve types of sports and stress appraisal and emotional distress as a stress response, among women. Mean PSS and GHQ scores, corresponding standard deviations,  $F$ -statistics with levels of significance, and calculated effect sizes are listed. Significant results are bold and marked by asterisk.

♀ Stress appraisal PSS					♀ Emotional distress GHQ				
Types of sports	$M$	$S.D.$	$F$ (p)	Cohen's $d$	Types of sports	$M$	$S.D.$	$F$ (p)	Cohen's $d$
Ball games	10.73	4.52	3.013 (n.s.)	0.32	Ball games	1.43	1.71	0.864 (n.s.)	0.15
Running	11.65	5.83	2.141 (n.s.)	0.18	Biking	1.43	2.20	1.340 (n.s.)	0.16
Racket games	11.83	5.98	1.369 (n.s.)	0.14	Fitness	1.53	2.57	1.734 (n.s.)	0.12
Biking	12.17	5.37	0.367 (n.s.)	0.08	Dance	1.61	2.27	0.335 (n.s.)	0.07
Fitness	12.53	5.91	0.011 (n.s.)	0.01	Athletics	1.81	2.56	0.002 (n.s.)	0.00
Sliding sports	12.60	4.74	0.002 (n.s.)	0.01	Walking	1.82	2.68	0.417 (n.s.)	0.01
Athletics	12.63	6.21	0.009 (n.s.)	0.01	Water sports	1.92	3.14	0.122 (n.s.)	0.05
Gymnastics	12.65	5.63	0.003 (n.s.)	0.02	Gymnastics	1.95	2.54	0.060 (n.s.)	0.06
Dance	13.02	5.32	0.135 (n.s.)	0.08	Racket games	1.96	2.73	0.143 (n.s.)	0.07
Water sports	13.22	6.46	0.960 (n.s.)	0.12	Running	2.20	3.07	1.389 (n.s.)	0.17
<b>Walking</b>	<b>13.85</b>	<b>6.69</b>	<b>5.528 (*)</b>	<b>0.25</b>	Sliding sports	2.60	2.31	0.649 (n.s.)	0.30
<b>Meditation sports</b>	<b>16.00</b>	<b>6.83</b>	<b>4.195 (*)</b>	<b>0.59</b>	<b>Meditation sports</b>	<b>3.58</b>	<b>4.14</b>	<b>5.789 (*)</b>	<b>0.68</b>

\* $p < .05$ .

**Table 6**

Results of MANOVAs assessing the relationship between twelve types of sports and stress appraisal and the stress response of emotional distress, among men. Mean PSS and GHQ scores, corresponding standard deviations, *F*-statistics with levels of significance, and calculated effect sizes are listed. Significant results are bold and marked by asterisk.

♂ Stress appraisal PSS					♂ Emotional distress GHQ				
Types of sports	<i>M</i>	<i>S.D.</i>	<i>F</i> ( <i>p</i> )	Cohen's <i>d</i>	Types of sports	<i>M</i>	<i>S.D.</i>	<i>F</i> ( <i>p</i> )	Cohen's <i>d</i>
Horse sports	8.53	5.85	3.123 (n.s.)	0.43	Horse sports	1.11	1.49	0.880 (n.s.)	0.24
Martial arts	9.00	4.69	1.564 (n.s.)	0.34	<b>Ball games</b>	<b>1.26</b>	<b>1.88</b>	<b>6.083 (*)</b>	<b>0.20</b>
Ball games	10.24	5.09	3.059 (n.s.)	0.13	Athletics	1.35	2.35	0.603 (n.s.)	0.14
Racket games	10.40	4.96	0.656 (n.s.)	0.09	Racket games	1.57	2.41	0.299 (n.s.)	0.05
Walking	10.44	5.74	0.043 (n.s.)	0.08	Walking	1.65	2.48	0.092 (n.s.)	0.02
Fitness	10.48	5.77	0.680 (n.s.)	0.07	Running	1.65	2.52	0.081 (n.s.)	0.02
Running	10.76	5.95	0.027 (n.s.)	0.02	Martial Arts	1.66	3.26	0.001 (n.s.)	0.01
Biking	11.28	5.77	2.443 (n.s.)	0.10	Biking	1.73	2.63	0.380 (n.s.)	0.02
Athletics	11.44	4.9	0.353 (n.s.)	0.11	Fitness	1.83	2.61	0.020 (n.s.)	0.06
Folk games	12.12	5.73	0.921 (n.s.)	0.23	Folk games	2.12	2.62	0.705 (n.s.)	0.18
Water sports	12.17	5.42	1.995 (n.s.)	0.25	<b>Water sports</b>	<b>2.79</b>	<b>3.26</b>	<b>6.709 (*)</b>	<b>0.46</b>
Sliding sports	13.10	6.48	1.527 (n.s.)	0.41	Sliding sports	3.20	3.73	3.592 (n.s.)	0.61

\**p* < .05.

### The central finding

#### No “one-activity-fits-all recommendations”

Results showed very little difference in perceived stress and in emotional distress among the women and men who participated in different types of sports; suggesting that probably no sport can be crowned “the best” as far as MH benefits are concerned, if the personal preferences of different individuals are respected. Hence, the position of this study is that “one-activity-fits-all recommendations” are probably neither appropriate nor desirable. Previous work already indicated that participation in types of sports based on personal favourites can enhance the potential of sports for MH benefits (Berger & Owen, 1992). Accordingly, the fundamental requirement for any PA to provide MH benefits is to be based on expressed personal preferences (Whitelaw, Swift, Goodwin, & Clarck, 2008). Indeed, when individuals choose to practice sports which fit their personal likes and styles, they can easily enjoy the exercise, and derive a sense of self-satisfaction from it, increasing the odds of MH benefits following from participation in that sport (Miller, Bartolomew, & Springer, 2005; Mills, Reiss, & Dombeck, 2008; Wankel, 1993). Thus, the present study carries an important message, which should not be taken for granted, but brought to the attention of individuals, that is, different sports are suitable for different individuals, and it is important that one finds the sport that suits one best. The fact that this general conclusion applied for both the results in women and in men may indicate that this message transcends essential demographics and reaches to core individual levels. Hence, individuals need to be consciously exposed to different types of sports, seeking to find out what it is that they like and enjoy. Furthermore, individuals need to get mentally involved and monitor their preferences, classify them, and choose their absolute favourite.

Evidently, such pure individualization of PA may present certain difficulties; however, the promise that it would facilitate mindful PA makes it a worthwhile enterprise. This point is supported by the documented positive impact that mindfulness has on MH, materialized through more positive well-being, less cognitive and emotional disturbances, elevated self-esteem and subjective vitality, greater self-actualization, autonomy, relatedness, and competence (Brown & Ryan, 2003). Our theory on mindful movement is supported by previous work that linked PA to personal growth. Ultimately, developing mindfulness means personal growth, that is, a process by which individuals gain in awareness or understanding of themselves, and, as result of that awareness, they experience changes in their feelings, beliefs, attitudes, behaviours, or views of themselves, in a direction of improved effectiveness, accuracy, or health (Epstein, 1999; Novack, Epstein, & Paulsen,

1999). In turn, enhanced awareness facilitates optimal appraisals and coping with life stress (Pearlin & Schooler, 1978), because stress responses depend on a person's interpretations of stressful situations, which greatly depend on personal resources such as mindfulness (Park, 1998). Alternatively, PA plays a valuable role in personal growth (e.g., Benson & Proctor, 1984; Berger, 1994; Kabat-Zinn, 1990; Ornish et al., 1990), allowing the transcendence of a “bland existence” (Franks, 1994; Meier, 1994), because it can help one focus attention inwards and pause in the present moment.

In addition, we believe that the documented significant positive associations between PA and enhanced self-esteem (Sonstroem, 1984), improved self-efficacy (Sonstroem & Morgan, 1989), and increased feelings of competence and mastery, which likely enable individuals to appraise stressors as less threatening or harmful and thus to perceive less stress (Long, 1993; Wijndaele, Matton, Duvigneaud, Lefevre, De Bourdeaudhuij, 2007), may include manifestations of the potential of PA to develop mindfulness. Nonetheless, given the absence of the precise definition of mindfulness that was just recently provided by Brown et al. (2007a, 2007b), mindfulness and self-control overlapped in terms like self-esteem, self-efficacy, competence or mastery. However, “unlike self-control, mindfulness is not primarily a tool to keep the self moving in a preordained direction (*i.e.*, ...an ongoing, effortful regulation of goals and a focus upon achievement). It is rather the capacity to, first and foremost, be aware of the ongoing parade put on by the self, including one's attempts to exert self-control”. This is why, “mindfulness may even permit better choices about whether and when to control the self in the service of chosen ends, and when it might be better to step out of the parade” (Brown et al., 2007b). In the light of the recent work conducted in mindfulness research, the utility of future studies examining the MH benefits of mindful PA has a sound base. We hypothesize that future research on the MH benefits of mindful movement would support the idea that by turning PA into mindful movement, its quality gets elevated and its potential for MH benefits gets maximized. Moreover, based on the evidence of the beneficial effects that mindfulness has upon MH, we further believe that encouraging mindful movement in the general public can be a cost-effective solution for the emotional distress plague hindering the MH of the contemporary society.

### Additional findings

#### Understanding the finest details in the physical activity – mental health relationship

Although the general conclusion of the present study is that mindful PA needs to be a sport that is liked by its practitioner, and

the actual type of sport is negligible in importance, results have nevertheless pointed out four types of sports that were prominent relative to stress: two in women, and other two in men. Significant associations between participation in walking and in meditation sports manifested with both stress appraisal and emotional distress among women, and significant associations between participation in ball games and in water sports manifested with emotional distress among men. Within these associations, women whose favourite sports were walking and meditation sports, and men whose favourite sports were water sports scored significantly higher on the MH measures than the rest of the women and men in the sample. Nonetheless, even these women and men have signalled fairly good MH. The highest scores on both MH measures were reported by the women whose favourites were meditation sports. This could be expected to certain degrees because chances are real that these women have chosen to attend Yoga and Tai Chi exactly because they were concerned with troubling thoughts or feelings. As Salmon (2001) stated, given the potential of PA to improve emotional state, it should not surprise that among sport participators many take up their exercise because of emotional problems. In addition, Yoga and Tai Chi were previously “proclaimed” excellent stress-relieving practices (Berger & Owen, 1988; Mills et al., 2008), and some evidence shows the stress-reducing effects of a single Yoga session (Berger & Owen, 1988). Furthermore, it is also known that individuals likely employ a specific sport as compensation for life-dissatisfaction, especially if they have already experienced gratification from that sport (Spreitzer & Snyder, 1989).

The last research question addressed by this study was “Which layers of ego-based self can be identified in women and in men that could be transcended by practising mindful PA?” and we attempt to answer it by discussing the above findings in a theoretical reasoning that connects these significant associations to existing qualitative data, in order to highlight insight about gender related variations in the relationship between sport participation and stress. The insight revealed this way can be of great interest for future research. For this theoretical reasoning, emphasis will be placed on the only element of motivation included in the present study, that is, the participants’ choice for their favourite sports. In addition, the below arguments rely on the capacity of PA and sport participation to be efficient leisure coping strategies (Berger, 1994; Edlin & Golanty, 2007; Ewart, 1985; Mills, 1985).

Women and men were previously found to attach different meanings to their leisure coping, even within the same stress-coping theme (Iwasaki, MacKay, & Mactavish, 2005). Specifically, Iwasaki et al. (2005) found that women valued ‘leisure for self-rejuvenation’ as means of compensating for the cumulative effects of juggling a wider range of stressors or demands than men, whereas men valued ‘leisure for self-rejuvenation’ primarily for the process of leisure in itself. Further, women clearly associated their involvement in ‘leisure as personal space’ and ‘leisure as means for deflecting stress-inducing thoughts’ with positive affect, contrary to men who did not make such association. Finally, women’s motivation for ‘leisure as personal space’ was based on their tendency to “always give and care for others”, whereas men’s motivation was based on their need for “leisure time and space as a personal reward”. Finally, women emphasized “proactively keeping healthy, and working to prevent stress from occurring before stress becomes manifest, through exercise”, whereas men, highlighted the importance of experiencing “sense of control and playing hard in leisure”, along with sport spectatorship.

In the same line, another study on the meanings attached to pool swimming among French women and men (Vignal, Champely, & Terret, 2001) found that women practiced recreational swimming in search of mental relaxation and physical and psychological

well-being, whereas men preferred to concentrate on performance, endurance, and technique, with the objective to optimize their practice and to experience “complete freedom from all social constraints”. Moreover, for realizing this objective, men expressed a desire to see swimming-lane-markers strictly delimiting the aquatic space. These findings line up in an intriguing fashion with observations about women’s and men’s attitudes, coping styles, and (stereotypical) profiles, which will be next presented, first for women’s, then for men’s case. The aim is however not the gender-based separation of individuals, but rather the recognition of the common human nature underneath the gender differences, which is revealed once these differences and particularities are acknowledged, respected, and ultimately transcended.

### Women’s case

The fact that women are generally expected to occupy multiple roles at the same time (e.g., wife, mother, homemaker, caregiver, employee and/or professional) (Rosenfield, 1999) may incline women to constantly strive to measure up to others’ and their own expectations in meeting these demands, and to generally underestimate the weight of the burdens they place upon themselves (Martire, Stephens, & Townsend, 2000). As a result, compared to men, women perceive more stress and seem more vulnerable to common MH problems such as depression and anxiety (WHO, 2009). Some considered that central to these issues of women are elements of lower self-esteem, increased self-doubt and self-blame, and less perceived control, influence, and power compared to men (Davidson & Fielden, 1999; Philips-Miller, Campbell, & Morrison, 2000). This may explain why women in the present study have reported significantly higher PSS scores than men, that is, non-optimal appraisals, denoting a negative balance between perceived danger and perceived competence.

However, based on the “Tend and Befriend Theory” (Taylor et al., 2000) it can be argued that women’s ability to care, nurture, connect, and bond is also their need. Hence, compared to men, women have consistently stronger affiliative responses to stress (Tamres, Janicki, & Helgeson, 2002; Taylor, 2002), and use more frequently emotion-focused coping strategies (Ptacek, Smith, & Zanas, 1992; Stone & Neale, 1984), in addition to-, rather than instead of-, behavioural coping strategies such as taking direct and positive actions to deal with problems (Fielden & Davidson, 2001; Gianakos, 2000). This (stereotypical) portray of women might underlie the meanings that women attached to their leisure coping (Iwasaki et al., 2005) and their swimming practices (Vignal et al., 2001) described above.

Furthermore, compared to men, women are known to be more health conscious and thus they value more preventative health behaviour (Young & White, 2000), show more willingness to develop and use coping skills such as active planning and time management to juggle work and family responsibilities effectively (Gianakos, 2000), strive more to improve their relationships (Martire et al., 2000), and put generally more time and effort into practices based on self-expression through movement (Louveau & Davaisse, 1991; Vignal et al., 2001). In addition, women search for personal growth and thriving following stressful situations as opposed to men who are much less interested in self-enhancement (Park, Cohen, & Murch, 1996; Tedeschi & Calhoun, 1996). This may be the underlying reason why in the present study associations between sport participation and stress appraisal manifested only among women. Besides, all these interlinked findings allow the supposition that women might use sport participation for stress (and guilt) relief, countering their overload, but also for reflection upon self and thus personal growth, with the potential aim to improve themselves so they can care better for others. Accordingly,

these may be layers of ego-based self that can be recognized and transcended through mindful PA.

The types of sports involved in the significant associations that were found among women (i.e., meditation sports and walking) support the above ideas. Meditation sports serve perhaps more obviously the purpose of stress relief, self-enhancement, and development of awareness or mindfulness, since they include additional stimuli (beyond the physical), which aim to quiet and focus the mind. These cognitive elements in sport participation seem important to women, as also shown by Brown et al. (1995). In their experiment, women obtained more MH benefits from PA including cognitive elements, whereas men derived MH benefits from intense PA without cognitive elements. Somewhat less obvious, yet still reasonable, is the view that walking can also serve as means for stress relief and present moment focus. Essentially, walking provides opportunities for observation of things and reflection on matters that otherwise are left unattended or can get lost in the pressure of daily living. This way, walking creates fertile ground for internal balance. Hence, walking was found to refresh perspectives such that personal problems feel less serious following it (Thayer, 1987). In line with our reasoning, previous findings showed that it is significantly more likely in women than in men that MH benefits will follow from walking (Asztalos, Cardon, & De Bourdeaudhuij, 2009; Ransford & Bartolomeo, 1996).

### Men's case

Conversely, when confronting stressful situations, men tend to use denial and fantasy to a greater extent than women (Ben-Zur & Zeidner, 1996; Vingerhoets & Van Heck, 1990), and they often try escaping distressing feelings or dealing with them, as in “my mind goes blank when I do sports” or “I don't even think about my problems anymore when I do sports” (Blalock & Joiner Jr., 2000). The result of coupling these findings with the previously described meanings that men attached to their leisure coping (Iwasaki et al., 2005) and to their swimming practices (Vignal et al., 2001), may be the supposition that men could attach a meaning of “tuning out from hassles” to their sports participation. This may also be reflected in the types of sports that were prominent among men in the present study (i.e., ball games and water sports). Ball games allow for competition, which, in turn sets the stage for a “playing hard” experience, as men usually compete against men, encouraging 100% effort investment in the game, and facilitating “freedom from all social constraints”. Hence, half of all men who participated in competition in our sample chose football, basketball, or volleyball. In addition, clear-cut sets of rules apply in ball games, which virtually everyone respects; thus, the environment is quasi controllable. Water sports, represented by pool swimming in 80% of cases in this study, allow for experiencing pure “sense of control”, likely because almost every muscle in the body is used when swimming; hence, this sport promotes stamina, mobility, and overall strength. The water not only adds resistance to the movements, but it also forces the participants to use their core muscles to help the body remain stabilized in the water (Holloway, 2007). Swimming men can also challenge themselves to improve their technique, performance or endurance, investing 100% effort in this competition against self, thus allowing for “my mind goes blank” scenarios.

Furthermore, considering the fact that the great majority of men in the sample who chose for water sports as their favourite belonged to the white-collar (high SES) category, one might also wonder whether these men used “time out swims” to cope with the pressures of their achievement driven professional lives and the corresponding struggles with time. The stresses associated with the competitive environments hosting white-collar jobs (Judge, Boudreau, & Bretz, 1993) may underlie both the fact that high SES men reported significantly more emotional distress than low SES

men (i.e. men with blue-collar jobs), and the fact that men who preferred water sports reported significantly higher levels of emotional distress than the rest of men. According to Holloway (2007), swimming has a meditative quality; it can soothe the mind and help turn attention away from the stresses of the day; hence, it creates ideal conditions for experiencing “freedom from all social constraints”. Ultimately, water is the factor that differentiates swimming and water sports from other sports and its beneficial effects represent the fundament of the acknowledged pain- and stress-relieving properties of hydrotherapy (Keegan, 2003). Thus, this might be also the underlying reason why “swimmers really do feel better after swimming” (Berger & Owen, 1983).

Consequently, the possibility that men might use sports as outlet for their stressful thoughts and disturbing emotions seems acceptable, and in the same line, sport participation may serve men as an emotion-focused coping strategy such as distancing or escape-avoidance. This role of sport participation in stress management identifies with the particular way in which Howley and Franks (1992) understood PA: “a valuable cleansing agent for the mind and emotions”, or “a beneficial catharsis that erases cluttered states and allows the individual to start fresh afterwards”. Similarly as for women, stereotypical social roles can be found at the root of the suppositions regarding the meaning that men might attach to sport participation. Hence, using sport participation to “tune out from hassles” might be rooted in early socialization, where men were (stereotypically) portrayed as independent, instrumental and cool rational (Ptacek, Smith, & Dodge, 1994). Men were socially conditioned and taught to be assertive, combative, and disconnected, and, as a result, the majority of men choose to conceal their feelings, intending to at least apparently keep them under control, even though this may not serve their own best interests (Men's Health Forum, 2006). For example, men's reluctance to disclose emotional struggle and to seek assistance or professional help, often leads to aggravated health problems (Dindia & Allen, 1992; Men's Health Forum, 2006; WHO, 2009). Mindful PA can assist men in recognizing these layers of ego-based self, which can substantially enhance men's well-being and MH (Brown, Ryan, & Creswell, 2007a).

### Conclusions

Our findings intend to inspire future research to examine the potential of mindful PA to assist women and men in profound stress relief, by facilitating recognition of the layers of ego-based self that allows awareness to show. In women, this seems to refer to a process of self-enhancement aimed to increase women's caring capacities and free them from struggling with guilt. Conversely in men, this seems to refer to a process of “time out” and distancing from hassles and duties aimed to refresh their potential to solve problems and eliminate their frustrations. Essentially, both women and men seek contentedness with their self as they know it, which however is mainly their ego-based self. Through the practice of mindful PA, women and men can develop a non-judgemental attitude towards themselves and the world around them, that is, mindfulness, which allows them to experience “living in the here and now”, thereby preventing feeling overwhelmed by the fears of the future or the regrets of the past. The examples outlined above show an apparent bipolarity in the potential of sport participation to influence stress management, including a self-enhancement strategy seemingly specific for women and an escaping distancing strategy seemingly specific for men. It is important however that the ideas proposed in this study are not rigidly considered. Occasional “time out” from duties can be very beneficial also for women, and self-enhancement is certainly a worthwhile endeavour also for men. The double role that sport

participation (and PA) may play in the management of stress as proposed in this study, supports the idea that an individual needs both feminine and masculine qualities in order to be successful and happy (Korabik & Ayman, 1989). Accordingly, this paper does not intend to divide women and men, but rather to highlight the wonderful potential of mindful PA to unite individuals at a deeper level, by helping them recognize their ego-based self, and allowing their clear awareness (i.e., true self) to be revealed. Essentially, both women and men seem to seek freedom from disturbing feelings and thoughts through sports participation, and this substantiates our theory on mindful movement. As Brown et al. (2007b) advocated, “ego-based functioning has adaptive and experiential costs (and benefits), and the study of mindfulness, awareness, and so on allows us to explore on a scientific basis what benefits may accrue to human experience and functioning when consciousness is more firmly grounded in awareness than in egoic states of mind. ...with the clear awareness that mental content continually arises, changes, and dissipates, the insubstantiality of the egoic self can be seen, permitting some degree of disidentification from it”.

Finally, the limitations and strengths of this study must be acknowledged. First, the design was cross-sectional; hence, it is not possible to ascertain the direction of causality in the associations. Conversely, they were well used in theoretical reasoning. In addition, the cross-sectional observation of associations facilitates understanding and creates knowledge base for future research, likely representing the best way to identify associations worth of further -ideally longitudinal- scrutiny. Second, the data came from self-report measures, which may present social desirability bias and recall problems. On the other hand, the same instruments also permit data collection from a large number of individuals at relatively low costs, which are important advantages (Sallis & Saelens, 2000). Third, regrettably, insufficient numbers of participants chose some types of sports, thereby reducing the total number of sport-types that could be analyzed relative to stress. Another limitation of the present study is the grouping of the specific sports into sport-type categories, which may have underestimated the difference in psychological, physiological and social consequences that participation in certain sports may have triggered in different individuals (e.g., ice hockey, cross-country skiing, speed skating).

Lastly, future research intending to continue the in-depth exploration of the PA-MH relationship needs to keep account also of seasonal changes in PA and MH. Environmental changes in ambient temperature, daylight, and monthly precipitation induce seasonal changes in PA. Studies have generally shown that PA increases from winter to spring and summer (e.g., Bergstralh, Sinaki, Offord, Wahner, & Melton, 1990; Haggerty et al., 1994; Uitenbroek, 1993). Furthermore, poor or extreme weather has been identified as a barrier to participation in PA among various populations (Tucker & Gilliland, 2007). On the other hand, seasonal changes occur in health as well, including in MH (Jia & Lubetkin, 2009). Specifically, the worst MH occurs during the spring and the fall, while the best MH is during the summer (Shephard & Aoyagi, 2009). The results in the present study were unaffected by seasonal changes; however, future research analyzing PA and MH needs to take account of the above mentioned issues regarding PA, and also of the possibility that individuals who are interviewed during spring or fall might score worse on MH questionnaires than the individuals who are interviewed during the summer. Moreover, even the same individual may score worse during spring or fall compared to summer, due to these seasonal changes in MH. Yet again, to our knowledge no other study has previously examined gender specific sport-type related variations in the PA-MH relationship including 12 different types of sports, and no research so far has proposed a theory similar to the mindful movement that we proposed here, or a complexity paradigm that can validly structure

the complexity of the PA-MH relationship as done in this study. Finally, a definite strength of this paper is that it gathered substantial comprehensive and valuable insight in one manuscript, and it connected its quantitative data to existing qualitative data, thus giving rise to stimulating theoretical arguments and important directions for future research.

“In order for man to succeed in life, God provided him with two means: education and physical activity. Not separately, one for the soul and the other for the body, but the two together. With these two means, men can attain perfection”. Plato (IV B.C.)

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