Sitting vs. standing: an urgent need to rebalance our world

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Abstract

During their activities of daily living, humans run, walk, stand, sit, and lie down. Recent changes in our environment have favored sedentary behavior over more physically active behavior to such a degree that our health is in danger. Here, we sought to address the problem of excessive time spent seated from various theoretical viewpoints, including postural control, human factors engineering, human history and health psychology. If nothing is done now, the high prevalence of sitting will continue to increase. We make a case for the standing position by demonstrating that spending more time upright can mitigate the physiological and psychological problems associated with excessive sitting without lowering task performance and productivity. The psychological literature even highlights potential benefits of performing certain tasks in the standing position. We propose a number of recommendations on spending more time (but not too much) in the standing position and on more active, nonambulatory behaviors. There is a need to inform people about (i) harmful consequences of excessive sitting and (ii) benefits of spending more time performing active, nonambulatory behaviors. One clear benefit is to reduce detrimental health consequences of excessive sitting and to provide potential additional benefits in terms of productivity and performance.

Keywords: Excessive sitting, health problems, standing position, performance, productivity

Outline of the main themes

In 2012, Ng and Popkins discussed that the first quantitative measures of the time spent seated was recorded in the 1950s. Their review showed that individuals all over the world, most importantly in high-income countries and emerging countries, are gradually increasing their time spent seated. This tendency will continue at least until 2030 (Ng & Popkin, 2012), especially because the coronavirus disease 2019 (COVID-19) pandemic has stimulated a marked increase in teleworking and Internet use (Belzunegui-Eraso & Erro-Garcés, 2020) – activities typically performed in the seated position. Individuals thus have to know how much time they spend seated per day and if this behavior can deteriorate their health. As too much time spent seated passively (in chairs, sofas) indeed deteriorates health (Bonnet & Barela, 2021; Levine, 2010), individuals thus have to know if and how spending more time in the standing position allows to avoid these health concerns without affecting their task performance and work productivity.

In the first section of this article, after the present outline, we discuss potential reasons why a large number of people in the world spend more time in the sitting position than in past history. In the second section, and in an extensive review of the literature, we discuss health-related issues caused by excessive sitting and what excessive sitting means. Based on our previous work (Bonnet & Barela, 2021), potentially half of the population worldwide may spend too much time in the sitting position (> 8 h/d), i.e. may develop excessive sitting. We agree that there is no consensus on this value but we discuss the validity and meaning of this value more below. We also agree that many other people in the world are not seated too much or even that some people stand too much in their waking days. However, our discussion only concerns these people spending too much time in passive sitting behaviors. For these people, we expect that their health would gain, and not deteriorate, in spending more time in the standing position, although not too much or not too abruptly, i.e. in adopting a better balance between sitting and standing.

In the third section, and independently of health, we provide reasons to believe that work productivity (on long periods such as weeks, months and years of work) and task performance (on short periods such as seconds, minutes and hours) may gain in spending more time in the standing position.

Lastly, in the fourth section of the article, we outline a series of inexpensive lifestyle measures that might promote a gradual shift towards healthier standing. We discuss the need for caution and the avoidance of too much standing, which itself is associated with well-documented health problems. We highlight that spending more time in active nonambulatory behaviors (e.g. sitting on a Pilates ball instead of sitting on a chair) could also be beneficial, but to a lower extend than more standing, at least for health.

The reader should note that our paper focuses on the problem of sedentariness, which is defined as any waking behavior in a reclining, sitting, or lying position that requires an energy expenditure lower than 1.5 Metabolic Equivalent Task (Gibbs et al., 2015). Sedentary behavior is not the same thing as physical inactivity (Dempsey et al., 2020; Tremblay et al., 2017) as physical inactivity is defined as spending 150 to 300 min/week of moderate physical activity or 75 to 150 min/week of moderate to vigorous physical activity (Bull et al., 2020). Simply standing puts an end to being seated, whereas physical inactivity must be replaced by physical activity.

1. The recent move toward more time spent in (passive) sitting

1.1. Greater use of sitting in daily life, driven by modern societies

Bipedalism is a key evolutionary characteristic of humans (Lovejoy, 2005b). Indeed, *Orrorin tugenensis* and *Sahelanthropus tchadensis* (who lived about 5 to 7 million years ago) and *Ardipithecus ramidus* (who lived about 4.4 million years ago) lived in trees but were able to use an early form of bipedalism (Harcourt-Smith, 2010; Prang, 2019). Later, *Australopithecus afarensis* (who lived until 3 million years ago) is thought to have been fully bipedal (Lovejoy, 2005b, 2005a). Ever since *Australopithecus afarensis*, humans have been the only species to use exclusively bipedal forms of locomotion (Lovejoy, 2005a). Researchers studying today's hunter-gatherers have argued that although our ancestors might have spent as much time doing nonambulatory activities as we do today, their nonambulatory behaviors were more active (e.g. squatting, kneeling and ground sitting) than passively sitting on a chair (Dewar & Pfeiffer, 2004; Raichlen et al., 2020; Speakman, 2020; Trinkaus, 1975). Our ancestors were also nomadic (Magnon et al., 2018). It is only about 5000 to 10000 years ago that humans began to settle down and build towns (Adams & Adams, 1981). They also began to sit more (e.g. on

benches; Grimsurd, 1990) but were still very physically active every day (Levine, 2010, 2015). It is only since the industrial revolution (i.e. approximately 250 years ago) that chairs started to be used in urban homes and schools (Grimsurd, 1990; Levine, 2015). During this period, work was facilitated by the technical progress, transportation and mechanical power provided by the industrial revolution. More recently (i.e. since the early 20th century), various social, environmental and individual factors have prompted people to increase the time spent passively sitting (Egger et al., 2001).

Sitting more was used to avoid standing for long period of time because the later has always been known to trigger health problems, such as back pain, lower limb pain, muscle fatigue, and circulatory problems (Baker et al., 2018). We also sit because people around us sit, and social norms encouraged people to adopt the same behaviors (Hadgraft et al., 2018; Melvin et al., 2020). Social norms also favored the sitting position to recover from certain diseases (Lee et al., 2012).

Environment at home have changed in the last hundred years. The introduction of various domestic devices and machines (TVs, washing machines, dryers, dishwashers, etc.) encouraged people to move less during activities of daily living at home (Bergouignan et al., 2016; Ng & Popkin, 2012). Likewise, people could find food in their refrigerator and drinking water on tap in their kitchen; they did not need to move as far as their ancestors did to find food and drink (Pruimboom, 2011). From the occupational standpoint, there has been a gradual transition toward more sedentary, less physically demanding jobs (Owen et al., 2010). People are also generally seated during transportation, which can sometimes account for a non-negligible proportion of the day (Bauman et al., 2018; Hadgraft et al., 2018). As a result, people in high-income countries sit for almost twice as long as people in low-income countries (Dempsey et al., 2020).

Environment at work has also changed. Chairs were used extensively in the workplace after World War II (Levine, 2015). In the 20th century, physical activity was thought to have a negative impact on intellectual work (Lee et al., 2012). It is still often thought today that seated intellectual work is more productive than upright intellectual work (Bergouignan et al., 2016; Gilson et al., 2011; Hadgraft et al., 2018). As societal pressure to increase productivity and profits grows, companies and organizations will not encourage people to stand more unless the change improves (or at least does not worsen) these economic variables (Labonté-LeMoyne et al., 2020). This is a social norm: spending more time seated is thought to be the best strategy for being productive (Bergouignan et al., 2016).

The Internet has been changing how lives and work are organized since the 2000s. People increasingly use networked communication technologies (e.g. smartphones), digital media (television, cable TV, web sites, etc.), hi-tech display screens, and computer-based entertainment devices (Ng & Popkin, 2012; Owen et al., 2020; Wang et al., 2019), most of which are primarily used in the sitting position. Exposure to media doubled between 1960 and 2009 (Biddle et al., 2018).

Although attempts to reduce the time spent seated have been made (Gardner et al., 2016; Landais et al., 2020; Michie et al., 2011), passive sitting is everywhere: in workplaces, meeting rooms, [video] conference rooms, classrooms, public transportation, private transportation, individual homes, video game playing, computer use, reading, watching TV, cinemas, concerts, music lessons, places of worship, waiting rooms, and many other public and private areas. Even if people did want to stand more, modern society and public norms would prevent them from doing so. Passive sitting is now the default modern lifestyle in most societies (Magnon et al., 2018). It constitutes the dominant body position in activities of daily living (De Craemer et al., 2018) and is an omnipresent, mass phenomenon (Jochem et al., 2018).

Other unexpected events can modify the time spent seated. For example, the periods of lockdown imposed in response to the COVID-19 pandemic in 2020 and 2021 might have accentuated sitting (Cheval, Sivaramakrishnan, et al., 2020). Specifically, it has been shown that lockdown is associated with more time spent seated in front of a screen (Amiri, 2018; Meyer et al., 2020) and more (often sedentary) teleworking (Belzunegui-Eraso & Erro-Garcés, 2020).

1.2. More time spent seated, as justified by the psychology literature

In this section, we briefly present three (though overlapping) types of theoretical model that investigate and try to understand changes in the time spent seated: sociocognitive models, dual-process models, and socioecological models. Note that this section is not intended to be exhaustive, but aimed to

highlight prominent models mobilized in the existing literature to understand health-related behaviors including physical activity and sedentary behaviors.

The sociocognitive models have been used to investigate the motivational precursors of sedentary behaviors (Biddle, 2011). The models are based on the hypothesis whereby goals are the first precursors of behavior (Brand & Cheval, 2019). Consistently with this sociocognitive approach, when people are motivated to sit less, they do succeed in spending less time seated (Aulbach et al., 2021; Maher & Dunton, 2020).

To account for the difficulties of the dominant socio-cognitive models to explain the gap between conscious goals and action – the so-called "intention-behavior gap" (Sheeran & Webb, 2016), dual-process models have gained traction. In brief, these models argue that physical activity behaviors are governed not only by controlled processes (e.g. attitudes and intentions) but also by automatic processes (e.g. spontaneous approach-avoidance reactions and habits) (Cheval, Radel, et al., 2018; Conroy & Berry, 2017). On one hand, controlled processes are slow as they require cognitive resources and involve conscious awareness. On the other hand, automatic processes are faster as they are initiated unintentionally, they do not require conscious awareness and they rely on well-learned associations and heuristic cues. Some recent studies have shown that a stronger habit for sedentary behaviors was associated with more time spent seated (Aulbach et al., 2021; Maher & Dunton, 2019).

Finally, adopting a broader perspective in order to better understand the multiple levels of influence on people behaviors, ecological models of sedentary behavior have been developed. These models, which was first introduced by Owen et al. (2011), argue that sedentary behaviors are jointly driven by multiple determinants. These factors can be classed as intrapersonal (individuals), interpersonal (social) and environmental (O'Donoghue et al., 2016). Specifically, demographic factors (e.g., sex, age), health-related factors (e.g., body mass index, cardiorespiratory fitness), motivational factors (e.g., intentions, attitudes) and socio-professional factors (e.g., type of job) are intrapersonal variables. The socioecological models seek to integrate automatic, controlled motivational precursors into a broader network (Rhodes et al., 2019; Sniehotta et al., 2017). To date, most of the studies that used socioecological models to understand sedentary behaviors focused on demographic and health-related factors (Chastin et al., 2015; O'Donoghue et al., 2016). For example, it has been reported that old age, a higher BMI, and male sex were associated with more time spent seated (Maltagliati et al., 2021; Saidj et al., 2015). Studies of socioprofessional variables showed that people who spent a lot of time seated at work tended to be seated during their leisure time (Maltagliati et al., 2021; Stamatakis et al., 2014), though this association was not consistently observed (Tigbe et al., 2011; Vandelanotte et al., 2013). With regard to interpersonal precursors, individuals with a higher number of children were seen to engage in less sedentary leisure-time activities, suggesting that family commitments can protect against long sedentary behaviors (Uffelen et al., 2012). Lastly, environmental variables are also associated with more leisure time spent seated, such as the day of the week (Maltagliati et al., 2021; Thorp et al., 2012), the weather (Chan & Ryan, 2009; Maltagliati et al., 2021), housing type and size, neighborhood safety and accessibility (Bauman et al., 2018). The way the environment is setup affects the time spent seated, as also discussed by Hadgraft et al. (2018) and Gorely and Ryde (2018).

Another reason for long sedentary behaviors is poor individual awareness of the latter's impact on health in general and non-communicable diseases in particular. For example, one study showed that the majority of people were barely aware or not at all aware of any advice related to sedentary behavior (Carson et al., 2013). Only 17 (5%) of the 331 people were well aware of these guidelines, and 106 (32%) were barely familiar with them (Carson et al., 2013).

Finally, according to the theory of effort minimization in physical activity (Cheval & Boisgontier, 2021), humans have an automatic tendency to minimize effort. This automatic tendency has been recently evidenced by multiple behavioral and EEG studies demonstrating that avoiding sedentary opportunities was associated with higher inhibitory control (Cheval, Daou, et al., 2020; Cheval et al., 2021; Cheval, Tipura, et al., 2018). For example, Cheval et al. (2018) study showed that participants showed more ample evoked-related potentials in the medial frontal cortex and frontocentral cortex, which have been related to conflict monitoring and inhibition, respectively. Likewise, the second study (Cheval et al., 2021) showed that, relative to stimuli depicting physical activity, participants exhibited greater inhibiting responses to

stimuli depicting physical inactivity as indicated by more ample evoked-related potentials in the frontocentral cortex. In sum, these behavioral and EEG results suggested that inhibitory control is required to avoid physical inactivity stimuli. Accordingly, in a modern environment in which opportunities to minimize effort are ubiquitous, this automatic tendency toward effort minimization can largely explain why individuals may spontaneously prefer sedentary behaviors over more physically active ones. Likewise, when the environment affords opportunities both for physically active and inactive behaviors, the decision-making processes may automatically favor the inactive solution, the engagement in the more active requiring additional cortical resources (Cheval et al., 2021; Cheval, Tipura, et al., 2018).

1.3. More time spent seated, as justified by the literature on postural control

People in the standing position sway and so need to control their balance continuously (Bonnet & Baudry, 2016a; Ivanenko & Gurfinkel, 2018). They sway because of internal constraints (the heart beating, the lungs filling and emptying, etc.), external constraints (e.g., gravity, wind, ground stability), and goal constraints (e.g. moving their hands to grab objects, or moving the head to look around) (Bonnet et al., 2010; Bonnet & Baudry, 2016a). Since the middle of the 19th century, researchers in the field of postural control have mostly considered postural sway to be a negative consequence of the standing position - a negative consequence that the brain needs to monitor and reduce. Increases and decreases in postural sway are considered to be markers of worse postural stability (Bonnet & Baudry, 2016b, 2016a; Mitra, 2003; Mitra et al., 2013) and better postural stability, respectively (Bonnet & Baudry, 2016b, 2016a). Taken as a whole and after more than 150 years of research in the literature on postural control, none of the models of postural control predict better task performance when standing than when sitting. Supposedly, the literature on postural control has influenced people to sit (rather than stand) when performing tasks.

Models in the literature on postural control are mostly interested in the capacity of the brain to maintain balance. Therefore, task performance when standing or even when standing is only analyzed as a secondary variable of interest. Some models even do not anticipate, i.e. do not propose hypotheses, whether task performance can be better or worse when standing vs. when sitting. This is so for example for the ecological model (Riccio & Stoffregen, 1988; Stoffregen et al., 1999), the synergistic model (Bonnet & Baudry, 2016a), the synergistic approach to motor control (Latash, 2008). Other models, however, such as the dominant cognitive models do suggest worse task performance when standing than when sitting if postural control (considered as the main task; Woollacott & Shumway-Cook, 2002) and/or the cognitive task (considered as the secondary task) are difficult enough. In fact, these dual-task models expect that attention is divided when an individual performs a so-called "dual task", i.e. when they perform a dual-task in the standing position. In the past, the main dual-task theories (capacity-sharing theories, bottleneck theories, the time-sharing theory, and the cross-talk theory (see Bayot et al., 2018) and their sub-theories all considered that the brain's attentional resources are limited during the performance of dual tasks; performance in at least one of the dual tasks should be impaired if the other is sufficiently challenging. All these models therefore logically expect that task performance and/or postural control should be worse during a challenging dual task than during separate (single) tasks (e.g. sitting and performing a cognitive task or standing and not doing anything). Exactly as for the models for sedentary behaviors, this discussion of the models in postural control was not intended to be exhaustive. It simply aimed to highlight prominent models used in the literature either showing no influence of bad influence of standing on task performance.

2. Today, too many people spend too much time seated

2.1. Objective time spent in the sitting position in published studies

Many objective measures of the time spent seated (based on accelerometers and/or inclinometers) have shown that the vast majority of healthy adults (aged 18-65) worldwide spend between 50% and 75% of their waking time in the sitting position. To the best of our knowledge, and after a deep search of all published manuscripts respecting these criteria, we only identified eight relevant studies (Carson et al., 2014; Gibson et al., 2017; Hamer et al., 2014; Healy et al., 2011; Loyen et al., 2017; Matthews et al., 2008; L. Smith et al., 2015; Vallance et al., 2011). In this selection, we have also considered the

bibliography of all selected manuscript. We have avoided discussing studies of the seated position based on self-reports because this subjective approach might provide inaccurate data and might underestimate the time truly spent sitting (Compernolle et al., 2019; Gardner et al., 2019; Prince et al., 2020; Stamatakis et al., 2019). Depending on the study in question, the objective time spent in the sitting position equated to an average of 8.44 hours per day (h/d) (Healy et al., 2011), 8.5 h/d both in the USA (Matthews et al., 2008), 8.5 h/d (Vallance et al., 2011) and 10.8 h/d both in Canada (Carson et al., 2014), 8.8 h/d in four European countries (England, Norway, Portugal, and Sweden) (Loyen et al., 2017), between 9 and 9.5 h/day in the UK (Gibson et al., 2017), 9.6 h/d (Hamer et al., 2014), and 10.6 h/day both in England (Smith et al., 2015). Overall, more than 50% of the 16-h waking day is spent seated (i.e. 8 h). Desk workers spend even more objective time in the sitting position (from 65% to 82% of their waking hours, depending on the study) (Gupta et al., 2016; Hadgraft et al., 2016). Furthermore, the time spent seated is socio-economically patterned – people with higher socioeconomical status have an occupation that often involves more time spent seated (Owen et al., 2020). Older (over-65) adults and people with comorbidities like heart disease, obesity, and pulmonary diseases spend even more time seated than members of the general population (Bauman et al., 2018; Dogra & Stathokostas, 2014; Ekelund et al., 2020).

2.2. Can we define a general threshold for excessive passive sitting?

We recognize that recent studies cautiously suggested not to provide thresholds for excessive passive sitting as not enough studies have been published in the literature to highlight any accurate threshold (Chaput et al., 2020; Dempsey et al., 2020; Stamatakis et al., 2019). We agree that the definition of subtle thresholds for excessive passive sitting is inappropriate and should not be provided, e.g. thresholds related to age, to gender, to countries, to jobs, to breaks of prolonged sitting behaviors, to physical activity and to many other influential factors. However, without any referential value, anyone may not feel concerned by general recommendations of any organization (Bonnet & Barela, 2021; Chaput et al., 2020) and may not search for alert signals (Compernolle et al., 2019). For this reason, in Bonnet and Barela (2021), we performed an extensive review of the literature to search for the highest limit or threshold not to cross for anyone in the world. We found and discussed that any individual should not sit more than 8 h/d (Bonnet & Barela, 2021). With caution, we explained that individuals may still be in danger for their health if they sit less than 8 h/d (e.g. 6-7 hours). Accordingly, many researchers have suggested lower thresholds than 8 h/d in specific contexts, such as sitting on the sofa watching TV (Ekelund et al., 2016; Patterson et al., 2018). In Bonnet and Barela (2021), we only suggested that sitting more than 8 h/d on a regular basis could be dangerous for health in any context and for any population. Consistently, Ekelund et al. (2016) suggested that sitting down passively for more than a 8 h/day was associated with a strikingly elevated risk of all-cause mortality – putting people in a so-called “danger zone”. Furthermore, all studies objectively measuring the time spent seated have found that sitting for more than 6 to 8 h/d is associated with the development of health problems in healthy adults (Chau et al., 2013; Dunstan et al., 2012; Gibson et al., 2017; Patterson et al., 2018; Pitanga et al., 2020; Rangul et al., 2018). Also, some studies objectively measuring the time spent seated even showed that health problems come even at 6 or 7 h/d when people sit in sofas (Ekelund et al., 2016; Patterson et al., 2018). We need to mention that 8 h/d is not an evidence-based definitive value. Further research should confirm or update this initial value, exactly as values of physical activity have been updated recently (Ekelund et al., 2020). At the practical level, this value is easy to remember as it corresponds to one third of the total day (24h/3) and half of a usual waking day (16h/2).

In section 2.1 we highlighted that more than half of the population worldwide spent too much time in the seated position and objective measures consistently showed that people spent more than 8 h/d in the sitting position. In section 2.2, we discussed that spending more than 8 h/d in the sitting position could be dangerous for health. In the coming section 2.3, we elaborate more on discussing health-related problems caused by excessive sitting, i.e. by spending more than 8 h/d in the sitting position.

2.3. Health-related problems caused by excessive sitting

Today, the literature suggests that excessive sitting is unhealthy (Bonnet & Barela, 2021; Levine, 2010, 2015; Pruimboom, 2011). In fact, excessive passive sitting in comfortable chairs or on comfortable

sofas has been linked to at least 35 disorders and conditions (Levine, 2015). For example, excessive passive sitting was shown to be related to premature mortality (Compernolle et al., 2019; Ekelund et al., 2016; Jones et al., 2019; Katzmarzyk et al., 2019; Labonté-LeMoyne et al., 2020; Owen et al., 2020; Prince et al., 2020), type 2 diabetes (Compernolle et al., 2019; Jones et al., 2019; Katzmarzyk et al., 2019; Labonté-LeMoyne et al., 2020; Magnon et al., 2018, 2018; Melvin et al., 2020; Patterson et al., 2018; Wang et al., 2019), cancers (Jones et al., 2019; Katzmarzyk et al., 2019; Magnon et al., 2018; Melvin et al., 2020; Owen et al., 2020; Patterson et al., 2018), cardiovascular disease (Compernolle et al., 2019; Jones et al., 2019; Katzmarzyk et al., 2019; Labonté-LeMoyne et al., 2020; Magnon et al., 2018; Melvin et al., 2020; Owen et al., 2020; Patterson et al., 2018; Prince et al., 2020; Wang et al., 2019), stroke (Stanczykiewicz et al., 2019), chronic inflammatory diseases (Levine, 2010; Pruimboom, 2011), musculoskeletal disorders such as lower back pain and knee/hip arthritis (Jones et al., 2019; Magnon et al., 2018), poor muscle endurance and loss of force (Patterson et al., 2018; Pruimboom, 2011), physiological problems such as sleep disorders (Wang et al., 2019), and immune and endocrine impairments (Pruimboom, 2011). Excessive sitting is also associated with a drop in arterial blood pressure, which can promote orthostatic intolerance (Pruimboom, 2011). Furthermore, excessive sitting is associated with hemodynamic and vascular problems (causing atherogenesis) (Patterson et al., 2018), the impairment of normal function in many cells and tissues, a decrement in the mitochondrial concentration in skeletal muscles, impaired metabolic flexibility (Pruimboom, 2011), and decrements in triglyceride hydrolysis and glucose evacuation (Magnon et al., 2018). Excessive passive sitting was also related to impairments in cognitive performance executive function and decision-making (Chandrasekaran et al., 2021; Pruimboom, 2011; Verhavert et al., 2020). Moreover, excessive passive sitting was associated with mental health problems such as anxiety (Stanczykiewicz et al., 2019; Wang et al., 2019), demotivation, discomfort (Finch et al., 2017; Kar & Hedge, 2016a), and depression (Verhavert et al., 2020; Wang et al., 2019). Some researchers have even suggested that depressive symptoms and time spent seated are reciprocally interlinked (Stanczykiewicz et al., 2019). More time spent seated is associated with more severe depressive symptoms, and the latter is associated with more time spent seated. It is important is to note that these problems might interact and cumulate their negative effects. Sitting deteriorates the will to stand (Pruimboom, 2011) and therefore creates a self-reinforcing vicious circle (Katzmarzyk, 2014). The aforementioned associations are likely to be bidirectional, since the development of physical and mental health conditions can increase the time spent sitting (Bauman et al., 2018; Rosenberger, 2012; Stanczykiewicz et al., 2019). Taken as a whole, health-related issues of excessive sitting exist at multiple levels, i.e. at microscopic and macroscopic levels of the body. The body seems to be broken down at any, or many, of these levels. All these problems might be due to the fact that the human body did not evolve to sit passively (Grimsrud, 1990; Jochem et al., 2018).

2.4. Making a case for more standing behavior for health

For million years, our ancestors were highly physically active; sitting for long periods is only a recent phenomenon (Bonnet & Barela, 2021; Jochem et al., 2018). Individuals have to avoid excessive sitting and therefore have to spend more time in standing to prevent as best as possible all these health concerns. Accordingly, many manuscripts discuss health-related benefits to spend more time in the standing position: their main message is ‘stand up for your health’ (Garland et al., 2018; Gibbs et al., 2018; Jeal & Salisbury, 2013; Sjögren et al., 2014). Important is to consider that in spending more time in the standing position, and therefore less time in the sitting position, is the easiest manner to limit and potentially to avoid the long list of health-related issues caused by excessive sitting. This is the main reason explaining that we make a case for more standing (but not too much or too abruptly), here for health concern.

3. Making a case for more standing behavior also for work productivity and task performance

3.1. Work productivity when standing vs. when sitting

On the long-term basis (for months and years) and for work productivity[1], one can expect that if individuals are affected by any or many of the aforementioned disease (see section 2.3), they may work less efficiently than if they were healthy (Brown et al., 2013). On this basis, work productivity may be negatively impacted to reach long-term objectives for months and years. So many issues are associated with sitting, at both physical and cognitive levels (Chandrasekaran et al., 2021) that it is unlikely to expect better work productivity when using excessive sitting than any other, more balanced body position. Accordingly, many studies have reported lower work productivity and/or work engagement among people who spend excessive time in the seated position (Chandrasekaran et al., 2021; Hendriksen et al., 2016; Munir et al., 2015; Puig-Ribera et al., 2015). In line with our argumentation, it has been suggested that spending too much time seated can be negative (or at least not beneficial) for work vitality, job satisfaction, and work performance (van Dommelen et al., 2016). Furthermore, spending more time in the standing position might also reduce the incidence of more subtle health consequences of sitting, such as sleepiness (Hosteng et al., 2019) low back pain (Greene et al., 2019), and discomfort (Waongenngarm et al., 2015). Standing meetings have been shown to be shorter but involve the same amount of information sharing than traditional seated meeting (Danquah & Tolstrup, 2020). Also, Bergouignan et al. (2016) showed that standing and walking 5 min every hours led people to feel lower levels of fatigue and higher energy during the day, it also improved their mood and vigor. We should also note that the reviews by Karakolis and Callaghan (2014) and Sui et al. (2019) were more positive than negative to show that the standing position could benefit work productivity. The researchers suggested that productivity tended to be higher when seated but that performance, presenteeism and other positive feelings (e.g. willingness to perform work) were more prominent when standing and/or being active at work (Sui et al., 2019). Furthermore, the standing position improves task engagement (i.e. interest and enthusiasm) (Finch et al., 2017).

3.2 Highlights from the literature on human history

Creativity and consciousness are key human qualities (Arons, 2007) and *Homo sapiens* is almost the only animal species that moves in the upright position at all times. This is why Arons (2007) suggested that the standing position may have prompted humans' creative capacity and consciousness. When upright, humans can manipulate objects with their hands and invent tools, which can incite creativity. Standing also creates a wide range of verbal capacities and potential verbal agility. Furthermore, the brain became larger and more complex after hominids had used the bipedal stance. Arons (2007) emphasized the high degree of genetic similarity between the chimpanzee and the human but also the radical differences in mental endowment and achievement. He concluded that one of the main physical differences between these two species – the standing position – could have caused the cognitive differences. If we could use an image, we would suggest that 'standing is a smart behavior'.

3.3. Highlights from the psychology literature

A large body of evidence in the psychology literature suggests that the standing stance can be beneficial for task performance in various activities. In fact, Chajut and Algom (Chajut & Algom, 2003) argued that a moderate level of stress restricts mental resources but also prompts the brain to focus the available resources on task-relevant elements and to ignore irrelevant elements. In other words, a moderate level of stress (e.g. such as that experienced in quiet standing) should enable more selective attention than a situation with a low level of stress (e.g. the seated position) (Chajut & Algom, 2003). If people are able to better focus their attention on an ongoing task, their performance might be better or at least not worse. Accordingly, two studies showed that a higher level of physiological arousal enhances attentional selectivity (Rosenbaum et al., 2017; Smith et al., 2019). In both studies, participants performed significantly better the modified Stroop task when standing than when sitting (Rosenbaum et al., 2017; Smith et al., 2019). We acknowledge that standing is not at all time beneficial for attentional selectivity, as shown by two recent research articles (Caron et al., 2020; Straub et al., 2022). Of note, these later researchers also failed to demonstrate that standing could lead to lower attentional selectivity. Another

[1] Here and throughout the manuscript, we make the distinction between work productivity analyzed in long-term exclusively (weeks, months, years) and task performance analyzed in short-term exclusively (seconds, minutes, hours).

confirmation of Chajut and Algom's (2003) theory can be found in Barra et al. (2015). In this study, the researchers used the attention network test in three body positions (sitting, standing with feet heel to toe, laying in a supine position). Participants either had an alerting priming or not. The results showed that participants were significantly faster with no alerting priming when they stood upright than in both other conditions. In other words, Barra et al. (2015) showed that participants exhibited higher level of alerting when standing than when sitting and lying. Chajut and Algom's (2003) theory was also highlighted in other publications (Ebara et al., 2008; Kar & Hedge, 2016b).

Other reasons can be discussed to explain why stance may be beneficial (at least indirectly) in ongoing activities. In fact, adoption of a more expansive posture seems to significantly increase the level of testosterone and decrease the level of cortisol – even after as little as two 1-minute trials (Carney et al., 2010). A feeling of greater power is known to lead to many benefits, such as a greater access to resources, enhanced cognition (Chajut & Algom, 2003; Kar & Hedge, 2016), more confidence, a more positive affect (Andolfi et al., 2017; Carney et al., 2010), greater task engagement, and greater endurance during a challenging task (Andolfi et al., 2017; Carney et al., 2010). More expansive posture significantly increases and decreases the level of testosterone and cortisol, respectively, even with only two trials of 1 min (Carney et al., 2010). Andolfi et al. (2017) explained that open postures lead to open mental framework, resulting in the exploration of more options than when seated, thus opening the mindset (Magnon et al., 2018). Finch et al. (2017) also suggested that participants exhibit greater task engagement (i.e., interest, enthusiasm, and alertness) when standing than when sitting. Simply by spending time in the standing position, an individual is better prepared for difficult, stressful situations (Carney et al., 2010). When standing, people are readier to change their posture, to move from one place to another, i.e. to be active, when they are upright than seated. We need to acknowledge that other studies failed to demonstrate any advantage of more open posture on power, as even suggested by Carney's publications (Carney et al., 2015; Jonas et al., 2017). However, as our society is always faster, the upright stance seems to be a modern posture to adopt in work places and even at home (Baker et al., 2018). At the general level, our biology is best adapted for the upright stance, not for the seated stance (Grimsrud, 1990; Levine, 2010, 2015; Pruimboom, 2011). Lovejoy (1988) suggested that bipedalism is among the first anatomical characteristics to mark the ascent to cognitive life. Hence, the perspective to live seated may be detrimental for our cognitive life, as also largely illustrated by Chandrasekaran et al. (2021). In the coming section, we illustrate whether these aforementioned benefits of standing may facilitate task performance and work productivity.

3.4. An extensive review of the literature on task performance when standing vs. when sitting or when less active to control the body position

3.4.1. Task performance when standing vs. when sitting in both postural control and human factors engineering

For short-term task performance (lasting some seconds and/or minutes), we performed an extensive review to investigate whether individuals better perform a task when sitting or when standing. All selected studies were found in two literatures, i.e. the literature on postural control and the literature on human factors engineering. We separated discussion of these two types of literature because task performance is the main outcome in the literature on human factors engineering while it is only a secondary outcome – after the discussion on postural control – in the literature on postural control. We studied only healthy young adults to avoid age-related and disease-related effects. We selected studies in which these participants performed any type of task such as purely cognitive tasks (e.g. counting in one's head), sensory tasks (e.g. visual task, auditory task, haptic task), or tasks requiring interaction with the environment (e.g. calling someone, taping on a keyboard). The key words used were: task performance, standing, sitting, attention, young adults. We used three websites (PubMed, Embase, and Cochrane Library) and the bibliography of all relevant manuscripts for our selection.

On one hand, in the literature on postural control, studies of task performance in the standing vs. seated positions have provided contradictory findings. Some studies showed that individuals need more time to respond to unpredictable auditory stimuli when standing than when seated (Remaud et al., 2012; Vuillerme & Nougier, 2004). Logically, the researchers concluded that the standing position required

more attentional resources than the seated position did (Remaud et al., 2012). These results did not mean that people would perform ongoing tasks worse when standing than when sitting but simply that performing these tasks in the standing position required barely more attentional resources. Other studies showed that performance in cognitive tasks (such as working memory tasks), verbal and visuospatial tasks (Dault et al., 2001), Brooks spatial and verbal tasks (Ehrenfried et al., 2003), and auditory-manual tasks (Stephan et al., 2018) was equivalent in the standing position and in the seated position. The latter findings did not validate the dual-task theories published in 1980s (Navon & Miller, 1987; Schneider & Chein, 2003; Schneider & Shiffrin, 1977; Shiffrin & Schneider, 1977) but, surprisingly, were not discussed as being disconcerting in this respect. On the other hand, the literature data on human factors engineering mainly show that task performance are equivalent when standing and when seated. The human factors studies of long periods of time at work and the use of sit-stand workstations (vs. sitting only) reviewed by Karakolis and Callaghan (2014) variously showed greater task performance (in 3 studies), no difference (in 4), or lower task performance (in 1). Likewise, Sui et al. (2019) reviewed a large amount of data on sitting vs. standing and/or walking stances and did not find major differences. Overall, most of the studies showed primarily that the seated and standing positions are equivalent with regard to performance.

3.4.2. Task performance when standing and controlling or not controlling the body position

In a recent manuscript, we performed a systematic review of the literature specifically to discuss whether standing and/or swaying could be beneficial for task performance in visual tasks in healthy, young adults (Bonnet & Hajnal, in revision). First, we searched for manuscripts testing task performance when participants had to change their body position (from one trial to another) but were restrained to eliminate postural sway. We included both manuscripts in which healthy young adults stood in all conditions but were constrained not to sway (as for example in standing against a wall) and manuscripts in which participants had to change their body position (e.g. sitting vs. standing) but only if a head-mounted display was used (so that the visual display was identical in both body positions). We used three websites (PubMed, Embase, and Cochrane Library) and the bibliography of all relevant manuscripts for our selection. As a particularity, we studied young adults who performed exclusively a visual task (any type of visual task). The key words used were: task performance, visual task, attention, posture, body position, young adults. The full methodology and the flow chart are fully described in this study. In the first review, we did not find any study to include but discussed the study by Geuss et al. (2010). In their six experiments, Geuss et al. (2010) showed that change in the level of arousal, but not change in the amount of postural sway, improved task performance in the perceived size of objects in the environment. In a second interrelated systematic review, we searched for manuscripts testing task performance when participants were constrained to sway more or less depending on the imposed body position. In this second review, selected studies included only studies with standing participants in which postural control was more or less challenged in various conditions. For example, participants could be required to place their feet in narrow stance (challenging condition increasing postural sway; Stoffregen et al., 2010) or stand more comfortably in wide stance (easier condition decreasing postural sway; Bonnet, 2012). In this second systematic review, eleven studies were selected (Doyon et al., 2019, 2021; Geuss et al., 2010; Hajnal et al., 2018, 2022; Mark et al., 1990; Masoner et al., 2020; Mitra, 2003; Mitra & Fraizer, 2004; Palatinus et al., 2013, 2014). This second review showed that healthy young adults were either better (8/11 studies) or at least as good (3/11 studies), never worse, in performing visual tasks when standing as when sitting. Therefore, task performance in visual tasks seems to be higher when standing and swaying than when standing and not swaying. Hence, as individuals sway much more when standing than when sitting (Roerdink et al., 2011; Vette et al., 2010), we may expect that task performance could be better, not worse, when standing than when sitting.

4. Recommendations on finding a balance between excessive sitting and excessive standing

4.1. Recommendations on standing more but not too much

From a precautionary standpoint, we recall that our recommendation of spending more time in the standing position during the day primarily concerns people who sit passively for more than 8 h/d (e.g. desk workers, older adults, people with comorbidities). It does not concern people spending too much

time in the standing position. In general, we recommend to reduce the time spent seated to get away from the danger zone. Even for those people who sit passively for more than 8 h/d, we certainly do not recommend to move from excessive sitting to excessive standing. Indeed, excessive standing is well known to create a variety of health problems reviewed elsewhere (Anderson et al., 2021; Baker et al., 2018; Halim & Omar, 2011; Shaikh & Shelke, 2016; Wall et al., 2019). People escaping from excessive sitting must not fall into the opposite issue and risk the problems associated with excessive standing.

4.2. Recommendations on making gradual changes in posture

The recommendation to spend more time in the standing position should be considered very carefully. To avoid creating health problems, people who want to increase their time spent standing should do so very gradually. For example, for someone used to sitting for 12 h/d, spending an additional hour per day in the standing position (i.e. 11 h/d sitting) would be considered as an exaggerated change because an additional hour can create many health problems (Baker et al., 2018). Standing up for 5 min/h might be a good initial recommendation (Bergouignan et al., 2016; Pitanga et al., 2020). Much useful advice on slightly increasing the time spent standing during the day has been published by other researchers (Danquah & Tolstrup, 2020; Landais et al., 2020).

4.3. Recommendations on frequently changing behaviors

An easy and effective way of increasing the time spent standing without causing the health problems linked to excessive standing is to alternate standing and sitting positions throughout the day. People could stand and perform their ongoing tasks while regularly changing their body position. Our modern world is dynamic and so we need to adopt (or rather readopt) an active posture. Also, any guidelines on spending more time in the standing position will depend on the country, the characteristics of the population, and the jobs performed. Indeed, standing up a little bit more during the day may not be easy for people with certain conditions (Dempsey et al., 2020). For example, the recent recommendations of the World Health Organization discussed the need for distinct recommendations for pregnant women, people with certain diseases (e.g. diabetes and cancer), and healthy older adults (Dempsey et al., 2020). However, on the physiological level, standing more is physiologically feasible. Indeed, our physiology enables anyone, especially healthy young adults to spend time in the standing position. In fact, humans are no less capable of activity than our ancestors. Moreover, humans become resistant to longer-term exercise once the body is habituated (Pruimboom, 2011). In summary, we suggest a gradual move from excessive sitting to an intermediate pattern of behavior with more standing as long as it is comfortable (Bonnet & Barela, 2021).

4.4. Recommendations on breaking excessive (prolonged) sitting behavior

The question whether it is beneficial or not for individuals to break their excessive sitting behavior is a question of debate. By break here, we simply mean standing or eventually walking around, in order to stop long periods of sitting behavior. On one hand in their review, Stamatakis et al. (2019) suggested that breaks of prolonged sedentary behavior, alone, may not be beneficial for health. On the other hand, in their meta-analysis Chastin et al. (2015) showed that breaking sitting may be beneficial to control adiposity and postprandial glycemia. Complementarily, in their review, Chandrasekaran et al. (2021) discussed that breaking excessive sitting may be beneficial for cognitive functions (attention, executive functions, visuospatial skills, memory). Here, we cannot make an extensive review of the literature discussing the effects of breaking excessive sitting as so many articles analyzed characteristics of sedentary behavior and characteristics of breaks (cf. Boerema et al., 2020). The recent guidelines of the World Health Organization also suggested that there is not enough evidence to provide recommendations on the frequency and/or duration of breaks of sedentary behavior. However, as a general feedback, we still recommend breaking excessive sitting behavior i) to break prolonged sitting behavior, ii) to create more active waking behaviors and iii) because to the best of our knowledge, no researcher discussed negative health effects of breaking excessive sitting. Further research should be conducted to better determine what are the best frequency/duration of these sedentary breaks to increase the potential health benefits.

Various strategies can be used to break excessive sitting (Hadgraft et al., 2018) and to change the habit of excessive and prolonged sitting (Dempsey et al., 2020; Owen et al., 2020). For example, various interventional techniques for promoting more standing in the workplace (based on "prompting", "social influence", "feedback", and "anchoring", etc.) have been discussed over the last decade (Landais et al., 2020; Michie et al., 2011). Landais et al. (2020) reported that in 68% of the studies reviewed, the workers approved these behavioral interventions. For example, short stand-up meetings are becoming more common and are generally liked by desk workers (Danquah & Tolstrup, 2020). Most office workers are in favor of interventions - even major ones - if the latter can improve their health (Venema et al., 2018). When travelling on a train, bus or metro or when waiting (e.g. for an appointment), people could stand (rather than sit) for these short periods of time. Any of these small changes would yield a few more minutes of standing a day. Everyone (and especially people in desk-based jobs) should feel confident enough to spend more time in the standing position during the working day. Specifically, for desk-based workers, the best way to increase the time spent in the standing position may be to use a sit-stand desk (Bonnet & Barela, 2021; Chambers et al., 2019; Karakolis & Callaghan, 2014; Sui et al., 2019). In fact, these desks allow individuals to frequently alternate sitting and standing to both avoid excessive sitting and to comfortably increase the time spent standing. With sit-stand desk, it is easy to avoid discomfort and health problems related to excessive sitting and excessive standing and take advantage of more standing in still being able to sit at any time.

4.5. General recommendations on adopting more active nonambulatory behaviors

Until this section, we recommended spending more time in the standing position. However, this is not the only option that could improve health. May be that adopting more active nonambulatory behaviors, in general, could also benefit health. Our message is that it may be better for health to spend more time per day seated on a Pilates ball than on a knee chair, it may be better for health to spend more time on a knee chair than on a stool, also it may be better for health to spend more time on a stool than on a chair. Although direct epidemiological evidence comparing the effects on health on active vs. inactive position is lacking, indirect evidence from an evolutionary biology of human physical activity perspective has been recently suggested. Specifically, Raichlen et al. (2020) study has shown that hunter-gatherers living today – representative of our ancestors' behavior – i) spent as much time doing nonambulatory behaviors as we do today but ii) spent significantly more time in more active nonambulatory behaviors (e.g. squatting, kneeling and ground sitting) than we do today. In other words, hunter-gatherers are more active in maintaining their balance than humans do today in passively sitting on their chair, hunter-gatherers contract more their muscles throughout the day than humans do today. We believe that this distinction is not trivial because today's hunter-gatherers are almost not affected by non-communicable diseases than people living in modern societies (Levine, 2010; Raichlen et al., 2020). With caution, hunter-gatherers also spend more time in physical activity than humans do today and it could directly explain why they are almost not affected by non-communicable diseases. Based on Raichlen et al.'s (2020) study, further research could test whether the more active the body to maintain balance, the better it could be for health. If true, a recommendation would be to be more active in general, throughout the waking day (Bonnet & Barela, 2021; Greene et al., 2019; Katzmarzyk, 2014) to better match the physiology of the human body – a body that has been used to physical activity for a million years (Jochem et al., 2018). Further research is also required to investigate the effects of more active nonambulatory behaviors on on work productivity and task performance.

4.6. Recommendations on performing more physical activity in general

The literature already emphasized that physical inactivity caused a large variety of non-communicable diseases (e.g. Andersen et al., 2016; Ding et al., 2016). In the present manuscript, we did not discuss these problems as we focused on excessive sitting. Moreover, a large number of studies have shown that non-communicable diseases caused by physical inactivity and problems associated with excessive sedentariness are independent factors. Accordingly, some epidemiological studies showed that health problems caused by excessive sitting are not greatly mitigated by physical activity (Boerema et al., 2020; Compernolle et al., 2019; Landais et al., 2020; Patterson et al., 2018; Stanczykiewicz et al., 2019;

Verhavert et al., 2020; Wang et al., 2019), except when the level of activity is very high (60-75 min/day or 420-525 min/week of moderate-intensity physical activity (Ekelund et al., 2020; Katzmarzyk et al., 2019; Owen et al., 2020). Health problems accumulate when people are inactive and also spend too much time seated (Ekelund et al., 2016; Katzmarzyk et al., 2019; Owen et al., 2020). Excessive sitting is only one problem that individuals are encountering in our modern societies and many other ones exist, such as physical inactivity also increasing dramatically (Ng & Popkin, 2012).

In summary, if individuals spend excessive time sitting, performing physical activity would hardly compensate for health problems related to sitting. Otherwise, individuals would have to spend an unattainable amount of physical activity, which represent an illusory level to reach as the general population already struggle to attain the minimal recommendation and even exhibit a decrease in physical activity over the last decades (Egger et al., 2001; Ng & Popkin, 2012). In other words, effort to further increase the level of physical activity to compensate the detrimental health effect of the excessive time spend sitting would remain a wishful thinking. Targeting a reduction of the time spent passively seated is the only viable alternative.

5. Summary and conclusions

Worldwide, the economically active adult population (aged from 18 to 65) is increasingly sedentary (Ng & Popkin, 2012), which represent a recent phenomenon in human history. Over the last 20 years, many objective studies have shown that people in various countries spend more than 8 h/d in the seated position (Carson et al., 2014; Gibson et al., 2017; Hamer et al., 2014; Healy et al., 2011; Loyen et al., 2017; Matthews et al., 2008; L. Smith et al., 2015; Vallance et al., 2011). The research described here and previously in Bonnet and Barela (2021) both show that individuals all over the world (but especially those in high-income countries) are in the danger zone for their health if the time spent seated increases or even hold at least higher than 8 h/d. Individuals could still be in danger for their health in spending 7 h/d or even only 6 h/d in the sitting position but at least they are most certainly in the danger zone in spending 8 h/d in the sitting position.

After describing health problems related to excessive sitting, the present manuscript has discussed how spending more time in the standing position represents a viable solution to escape these health problems. First, we explained that the more active to control balance during the waking days, the better for health. With caution, we recommended spending more time (but not too much or too abruptly) in the standing position, especially for people using excessive sitting, to become more balanced between standing and sitting. Second, we also discussed and showed that more time spent standing may potentially benefit both work productivity and task performance, or at least not deteriorate those performance. Therefore, modern societies should actually be prompting and encouraging people to spend more time in the standing position. In our expectation, the more individuals actively control their balance, the better it could be for their health. This expectation should be confirmed in further research.

Overall, the present review makes a case for more active nonambulatory behaviors greatly for health and more moderately for work productivity and task performance. Overall, from an epidemiological and economical viewpoint, it is hard to understand why our societies have counterproductively and counterintuitively constrained individuals to sit more in passive ways (Ng & Popkin, 2012).

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Bibliography

Adams, R. M., & Adams, R. M. (1981). *Heartland of Cities : Surveys of Ancient Settlement and Land Use on the Central Floodplain of the Euphrates*. University of Chicago Press.

Amiri, M. (2018). *Sedentary behavior in young people and related complications : An international challenge*. Circulation, 138, 11, e142-e159, https://doi.org/10.1161/CIR.0000000000000591

Andersen, L. B., Mota, J., & Di Pietro, L. (2016). Update on the global pandemic of physical inactivity. *Lancet (London, England)*, *388*(10051), 1255-1256. https://doi.org/10.1016/S0140-6736(16)30960-6

Anderson, J., Williams, A. E., & Nester, C. (2021). Musculoskeletal disorders, foot health and footwear choice in occupations involving prolonged standing. *International Journal of Industrial Ergonomics*, *81*, 103079. https://doi.org/10.1016/j.ergon.2020.103079

Andolfi, V. R., Di Nuzzo, C., & Antonietti, A. (2017). Opening the mind through the body : The effects of posture on creative processes. *Thinking Skills and Creativity*, *24*, 20-28. https://doi.org/10.1016/j.tsc.2017.02.012

Arons, M. (2007). Standing up for humanity : Upright body, creative instability, and spiritual balance. In Richards (Eds.). *Everyday creativity and new views of human nature : Psychological, social, and spiritual perspectives* (p. 175-193). American Psychological Association. https://doi.org/10.1037/11595-012

Aulbach, M. B., Konttinen, H., Gardner, B., Kujala, E., Araujo-Soares, V., Sniehotta, F. F., Lintunen, T., Haukkala, A., & Hankonen, N. (2021). A dual process model to predict adolescents' screen time and physical activity. *Psychology & Health*, https://doi.org/10.1080/08870446.2021.1988598

Baker, R., Coenen, P., Howie, E., Lee, J., Williamson, A., & Straker, L. (2018). A detailed description of the short-term musculoskeletal and cognitive effects of prolonged standing for office computer work. *Ergonomics*, *61*(7), 877-890. https://doi.org/10.1080/00140139.2017.1420825

Barra, J., Auclair, L., Charvillat, A., Vidal, M., & Pérennou, D. (2015). Postural control system influences intrinsic alerting state. *Neuropsychology*, *29*(2), 226-234. https://doi.org/10.1037/neu0000174

Bauman, A. E., Petersen, C. B., Blond, K., Rangul, V., & Hardy, L. L. (2018). The Descriptive Epidemiology of Sedentary Behaviour. In M. F. Leitzmann, C. Jochem, & D. Schmid (Éds.), *Sedentary Behaviour Epidemiology* (p. 73-106). Springer International Publishing. https://doi.org/10.1007/978-3-319-61552-3_4

Bayot, M., Dujardin, K., Tard, C., Defebvre, L., Bonnet, C. T., Allart, E., & Delval, A. (2018). The interaction between cognition and motor control : A theoretical framework for dual-task interference effects on posture, gait initiation, gait and turning. *Neurophysiologie Clinique = Clinical Neurophysiology*, *48*(6), 361-375. https://doi.org/10.1016/j.neucli.2018.10.003

Belzunegui-Eraso, A., & Erro-Garcés, A. (2020). Teleworking in the Context of the Covid-19 Crisis. *Sustainability*, *12*(9), Art. 9. https://doi.org/10.3390/su12093662

Bergouignan, A., Legget, K. T., De Jong, N., Kealey, E., Nikolovski, J., Groppel, J. L., Jordan, C., O'Day, R., Hill, J. O., & Bessesen, D. H. (2016). Effect of frequent interruptions of prolonged sitting on self-perceived levels of energy, mood, food cravings and cognitive function. *International Journal of Behavioral Nutrition and Physical Activity*, *13*(1), 113. https://doi.org/10.1186/s12966-016-0437-z

Biddle, S. (2011). Fit or sit? Is there a psychology of sedentary behaviour? *Sport & Exercise Psychology Review*, *7*, 2, 5-10, ISSN 1745-4980.

Biddle, S. J. H., Pearson, N., & Salmon, J. (2018). Sedentary Behaviors and Adiposity in Young People : Causality and Conceptual Model. *Exercise and Sport Sciences Reviews*, *46*(1), 18-25. https://doi.org/10.1249/JES.0000000000000135

Boerema, S. T., van Velsen, L., Vollenbroek, M. M., & Hermens, H. J. (2020). Pattern measures of sedentary behaviour in adults : A literature review. *Digital Health*, *6*. https://doi.org/10.1177/2055207620905418

Bonnet, C. T. (2012). Broad Stance Conditions Change Postural Control and Postural Sway. *Journal of Motor Behavior*, *44*(2), 125-131. https://doi.org/10.1080/00222895.2012.654526

Bonnet, C. T., & Barela, J. A. (2021). Health Issues Due to the Global Prevalence of Sedentariness and Recommendations towards Achieving a Healthier Behaviour. *Healthcare*, *9*(8), 895-905, Art. 8. https://doi.org/10.3390/healthcare9080995

Bonnet, C. T., & Baudry, S. (2016a). A functional synergistic model to explain postural control during precise visual tasks. *Gait & Posture*, *50*, 120-125. https://doi.org/10.1016/j.gaitpost.2016.08.030

Bonnet, C. T., & Baudry, S. (2016b). Active vision task and postural control in healthy, young adults : Synergy and probably not duality. *Gait & Posture*, *48*, 57-63. https://doi.org/10.1016/j.gaitpost.2016.04.016

Bonnet, C. T., & Hajnal, A. (in revision in Gait and Posture: ID # GAIPOS-S-22-00824). **B**eneficial effects of standing and swaying on task performance in goal-directed visual tasks: A systematic review

Bonnet, C. T., Temprado, J.-J., & Berton, E. (2010). The effects of the proximity of an object on human stance. *Gait & Posture*, *32*(1), 124-128. https://doi.org/10.1016/j.gaitpost.2010.04.005

Brand, R., & Cheval, B. (2019). Theories to Explain Exercise Motivation and Physical Inactivity : Ways of Expanding Our Current Theoretical Perspective. *Frontiers in Psychology*, *10*, 1147. https://doi.org/10.3389/fpsyg.2019.01147

Brown, H. E., Ryde, G. C., Gilson, N. D., Burton, N. W., & Brown, W. J. (2013). Objectively measured sedentary behavior and physical activity in office employees : Relationships with presenteeism. *Journal of Occupational and Environmental Medicine*, *55*(8), 945-953. https://doi.org/10.1097/JOM.0b013e31829178bf

Bull, F. C., Al-Ansari, S. S., Biddle, S., Borodulin, K., Buman, M. P., Cardon, G., Carty, C., Chaput, J.-P., Chastin, S., Chou, R., Dempsey, P. C., DiPietro, L., Ekelund, U., Firth, J., Friedenreich, C. M., Garcia, L., Gichu, M., Jago, R., Katzmarzyk, P. T., … Willumsen, J. F. (2020). World Health Organization 2020 guidelines on physical activity and sedentary behaviour. *British Journal of Sports Medicine*, *54*(24), 1451-1462. https://doi.org/10.1136/bjsports-2020-102955

Carney, D. R., Cuddy, A. J. C., & Yap, A. J. (2010). Power Posing : Brief Nonverbal Displays Affect Neuroendocrine Levels and Risk Tolerance. *Psychological Science*, *21*(10), 1363-1368. https://doi.org/10.1177/0956797610383437

Carney, D. R., Cuddy, A. J. C., & Yap, A. J. (2015). Review and Summary of Research on the Embodied Effects of Expansive (vs. Contractive) Nonverbal Displays. *Psychological Science*, *26*(5), 657-663. https://doi.org/10.1177/0956797614566855

Caron, E. E., Reynolds, M. G., Ralph, B. C. W., Carriere, J. S. A., Besner, D., & Smilek, D. (2020). Does Posture Influence the Stroop Effect? *Psychological Science*, 31, 11, 0956797620953842. https://doi.org/10.1177/0956797620953842

Carson, V., LeBlanc, C. M., Moreau, E., & Tremblay, M. S. (2013). Paediatricians' awareness of, agreement with and use of the new Canadian Physical Activity and Sedentary Behaviour Guidelines for children and youth zero to 17 years of age. *Paediatrics & Child Health*, *18*(10), 538-542. https://doi.org/10.1093/pch/18.10.538

Carson, V., Wong, S. L., Winkler, E., Healy, G. N., Colley, R. C., & Tremblay, M. S. (2014). Patterns of sedentary time and cardiometabolic risk among Canadian adults. *Preventive Medicine*, *65*, 23-27. https://doi.org/10.1016/j.ypmed.2014.04.005

Chajut, E., & Algom, D. (2003). Selective attention improves under stress : Implications for theories of social cognition. *Journal of Personality and Social Psychology*, *85*(2), 231-248. https://doi.org/10.1037/0022-3514.85.2.231

Chambers, A. J., Robertson, M. M., & Baker, N. A. (2019). The effect of sit-stand desks on office worker behavioral and health outcomes : A scoping review. *Applied Ergonomics*, *78*, 37-53. https://doi.org/10.1016/j.apergo.2019.01.015

Chan, C. B., & Ryan, D. A. (2009). Assessing the effects of weather conditions on physical activity participation using objective measures. *International Journal of Environmental Research and Public Health*, *6*(10), 2639-2654. https://doi.org/10.3390/ijerph6102639

Chandrasekaran, B., Pesola, A. J., Rao, C. R., & Arumugam, A. (2021). Does breaking up prolonged sitting improve cognitive functions in sedentary adults? A mapping review and hypothesis formulation on the potential physiological mechanisms. *BMC Musculoskeletal Disorders*, *22*(1), 274. https://doi.org/10.1186/s12891-021-04136-5

Chaput, J.-P., Olds, T., & Tremblay, M. S. (2020). Public health guidelines on sedentary behaviour are important and needed : A provisional benchmark is better than no benchmark at all. *British Journal of Sports Medicine*, *54*(5), 308-309. https://doi.org/10.1136/bjsports-2018-099964

Chastin, S. F. M., Egerton, T., Leask, C., & Stamatakis, E. (2015). Meta-analysis of the relationship between breaks in sedentary behavior and cardiometabolic health. *Obesity*, *23*(9), 1800-1810. https://doi.org/10.1002/oby.21180

Chau, J. Y., Grunseit, A. C., Chey, T., Stamatakis, E., Brown, W. J., Matthews, C. E., Bauman, A. E., & van der Ploeg, H. P. (2013). Daily Sitting Time and All-Cause Mortality : A Meta-Analysis. *PLoS ONE*, *8*(11), e80000. https://doi.org/10.1371/journal.pone.0080000

Cheval, B., & Boisgontier, M. P. (2021). The Theory of Effort Minimization in Physical Activity. *Exercise and Sport Sciences Reviews*, *49*(3), 168-178. https://doi.org/10.1249/JES.0000000000000252

Cheval, B., Cabral, D. A. R., Daou, M., Bacelar, M. F. B., Parma, J. O., Forestier, C., Orsholits, D., Maltagliati, S., Sander, D., Boisgontier, M. P., & Miller, M. W. (2021). Inhibitory control elicited by physical activity and inactivity stimuli : An electroencephalography study. *Motivation Science*, *7*, 386-399. https://doi.org/10.1037/mot0000236

Cheval, B., Daou, M., Cabral, D. A. R., Bacelar, M. F. B., Parma, J. O., Forestier, C., Orsholits, D., Sander, D., Boisgontier, M. P., & Miller, M. W. (2020). Higher inhibitory control is required to escape the innate attraction to effort minimization. *Psychology of Sport and Exercise*, *51*, 101781. https://doi.org/10.1016/j.psychsport.2020.101781

Cheval, B., Radel, R., Neva, J. L., Boyd, L. A., Swinnen, S. P., Sander, D., & Boisgontier, M. P. (2018). Behavioral and Neural Evidence of the Rewarding Value of Exercise Behaviors : A Systematic Review. *Sports Medicine (Auckland, N.Z.)*, *48*(6), 1389-1404. https://doi.org/10.1007/s40279-018-0898-0

Cheval, B., Sivaramakrishnan, H., Maltagliati, S., Fessler, L., Forestier, C., Sarrazin, P., Orsholits, D., Chalabaev, A., Sander, D., Ntoumanis, N., & Boisgontier, M. P. (2020). *Relationships Between Changes in Self-Reported Physical Activity and Sedentary Behaviours and Health During the Coronavirus (COVID-19) Pandemic in France and Switzerland* [Preprint]. SportRxiv. https://doi.org/10.31236/osf.io/ydv84

Cheval, B., Tipura, E., Burra, N., Frossard, J., Chanal, J., Orsholits, D., Radel, R., & Boisgontier, M. P. (2018). Avoiding sedentary behaviors requires more cortical resources than avoiding physical activity : An EEG study. *Neuropsychologia*, *119*, 68-80. https://doi.org/10.1016/j.neuropsychologia.2018.07.029

Compernolle, S., DeSmet, A., Poppe, L., Crombez, G., De Bourdeaudhuij, I., Cardon, G., van der Ploeg, H. P., & Van Dyck, D. (2019). Effectiveness of interventions using self-monitoring to reduce sedentary behavior in adults : A systematic review and meta-analysis. *International Journal of Behavioral Nutrition and Physical Activity*, *16*(1), 63. https://doi.org/10.1186/s12966-019-0824-3

Conroy, D. E., & Berry, T. R. (2017). Automatic Affective Evaluations of Physical Activity. *Exercise and Sport Sciences Reviews*, *45*(4), 230-237. https://doi.org/10.1249/JES.0000000000000120

Danquah, I. H., & Tolstrup, J. S. (2020). Standing Meetings Are Feasible and Effective in Reducing Sitting Time among Office Workers-Walking Meetings Are Not : Mixed-Methods Results on the Feasibility and Effectiveness of Active Meetings Based on Data from the « Take a Stand! » Study. *International Journal of Environmental Research and Public Health*, *17*(5), 1713-1720. https://doi.org/10.3390/ijerph17051713

Dault, M. C., Geurts, A. C. H., Mulder, T. W., & Duysens, J. (2001). Postural control and cognitive task performance in healthy participants while balancing on different support-surface configurations. *Gait & Posture*, *14*(3), 248-255. https://doi.org/10.1016/S0966-6362(01)00130-8

De Craemer, M., Chastin, S., Ahrens, W., Bernaards, C., Brug, J., Buck, C., Cardon, G., Capranica, L., Dargent-Molina, P., De Lepeleere, S., Hoffmann, B., Kennedy, A., Lakerveld, J., Lien, N., Ling, F., Loyen, A., MacDonncha, C., Nazare, J.-A., O'Donoghue, G., … Oppert, J.-M. (2018). Data on Determinants Are Needed to Curb the Sedentary Epidemic in Europe. Lessons Learnt from the DEDIPAC European Knowledge Hub. *International Journal of Environmental Research and Public Health*, *15*(7), 1406-1412. https://doi.org/10.3390/ijerph15071406

Dempsey, P. C., Biddle, S. J. H., Buman, M. P., Chastin, S., Ekelund, U., Friedenreich, C. M., Katzmarzyk, P. T., Leitzmann, M. F., Stamatakis, E., van der Ploeg, H. P., Willumsen, J., & Bull, F. (2020). New global guidelines on sedentary behaviour and health for adults : Broadening the behavioural targets. *International Journal of Behavioral Nutrition and Physical Activity*, *17*(1), 151. https://doi.org/10.1186/s12966-020-01044-0

Dewar, G., & Pfeiffer, S. (2004). Postural behaviour of Later Stone Age people in South Africa. *South African Archaeological Bulletin, 59,* 180, 52-58. https://doi.org/10.2307/3889243

Ding, D., Lawson, K. D., Kolbe-Alexander, T. L., Finkelstein, E. A., Katzmarzyk, P. T., Mechelen, W. van, & Pratt, M. (2016). The economic burden of physical inactivity : A global analysis of major non-communicable diseases. *The Lancet*, *388*(10051), 1311-1324. https://doi.org/10.1016/S0140-6736(16)30383-X

Dogra, S., & Stathokostas, L. (2014). Correlates of extended sitting time in older adults : An exploratory cross-sectional analysis of the Canadian Community Health Survey Healthy Aging Cycle. *International Journal of Public Health*, *59*(6), 983-991. https://doi.org/10.1007/s00038-014-0540-3

Doyon, J. K., Clark, J. D., Hajnal, A., & Legradi, G. (2021). Effects of Surface Luminance and Texture Discontinuities on Reachableness in Virtual Reality. *Ecological Psychology*, *33*(1), 1-30. https://doi.org/10.1080/10407413.2020.1820336

Doyon, J. K., Hajnal, A., Surber, T., Clark, J. D., & Kelty-Stephen, D. G. (2019). Multifractality of posture modulates multisensory perception of stand-on-ability. *PLOS ONE*, *14*(2), e0212220. https://doi.org/10.1371/journal.pone.0212220

Dunstan, D. W., Howard, B., Healy, G. N., & Owen, N. (2012). Too much sitting—A health hazard. *Diabetes Research and Clinical Practice*, *97*(3), 368-376. https://doi.org/10.1016/j.diabres.2012.05.020

Ebara, T., Kubo, T., & Inoue, T. (2008). Effects of adjustable sit-stand VDT workstations on workers' musculoskeletal discomfort, alertness and performance. *Industrial health*, *46*(5), 497-505.

Egger, G. J., Vogels, N., & Westerterp, K. R. (2001). Estimating historical changes in physical activity levels. *Medical Journal of Australia*, *175*(11-12), 635-636. https://doi.org/10.5694/j.1326-5377.2001.tb143758.x

Ehrenfried, T., Guerraz, M., Thilo, K. V., Yardley, L., & Gresty, M. A. (2003). Posture and mental task performance when viewing a moving visual field. *Cognitive Brain Research*, *17*(1), 140-153. https://doi.org/10.1016/S0926-6410(03)00088-0

Ekelund, U., Steene-Johannessen, J., Brown, W. J., Fagerland, M. W., Owen, N., Powell, K. E., Bauman, A., Lee, I.-M., Lancet Physical Activity Series 2 Executive Committe, & Lancet Sedentary Behaviour Working Group. (2016). Does physical activity attenuate, or even eliminate, the detrimental association of sitting time with mortality? A harmonised meta-analysis of data from more than 1 million men and women. *Lancet (London, England)*, *388*(10051), 1302-1310. https://doi.org/10.1016/S0140-6736(16)30370-1

Ekelund, U., Tarp, J., Fagerland, M. W., Johannessen, J. S., Hansen, B. H., Jefferis, B. J., Whincup, P. H., Diaz, K. M., Hooker, S., Howard, V. J., Chernofsky, A., Larson, M. G., Spartano, N., Vasan, R. S., Dohrn, I.-M., Hagströmer, M., Edwardson, C., Yates, T., Shiroma, E. J., … Lee, I.-M. (2020). Joint associations of accelerometer-measured physical activity and sedentary time with all-cause mortality : A harmonised meta-analysis in more than 44 000 middle-aged and older individuals. *British Journal of Sports Medicine*, *54*(24), 1499-1506. https://doi.org/10.1136/bjsports-2020-103270

Finch, L. E., Tomiyama, A. J., & Ward, A. (2017). Taking a Stand : The Effects of Standing Desks on Task Performance and Engagement. *International Journal of Environmental Research and Public Health*, *14*(8), 939-954. https://doi.org/10.3390/ijerph14080939

Gardner, B., Flint, S., Rebar, A. L., Dewitt, S., Quail, S. K., Whall, H., & Smith, L. (2019). Is sitting invisible? Exploring how people mentally represent sitting. *International Journal of Behavioral Nutrition and Physical Activity*, *16*(1), 85. https://doi.org/10.1186/s12966-019-0851-0

Gardner, B., Smith, L., Lorencatto, F., Hamer, M., & Biddle, S. J. H. (2016). How to reduce sitting time? A review of behaviour change strategies used in sedentary behaviour reduction interventions among adults. *Health Psychology Review*, *10*(1), 89-112. https://doi.org/10.1080/17437199.2015.1082146

Garland, E., Watts, A., Doucette, J., Foley, M., Senerat, A., & Sanchez, S. (2018). Stand Up to Work : Assessing the health impact of adjustable workstations. *International Journal of Workplace Health Management*, *11*(2), 85-95. https://doi.org/10.1108/IJWHM-10-2017-0078

Geuss, M. N., Stefanucci, J. K., de Benedictis-Kessner, J., & Stevens, N. R. (2010). A balancing act : Physical balance, through arousal, influences size perception. *Attention, Perception, & Psychophysics*, *72*(7), 1890-1902. https://doi.org/10.3758/APP.72.7.1890

Gibbs, B. B., Hergenroeder, A. L., Katzmarzyk, P. T., Lee, I.-M., & Jakicic, J. M. (2015). Definition, Measurement, and Health Risks Associated with Sedentary Behavior. *Medicine and science in sports and exercise*, *47*(6), 1295-1300. https://doi.org/10.1249/MSS.0000000000000517

Gibbs, B. B., Hergenroeder, A. L., Perdomo, S. J., Kowalsky, R. J., Delitto, A., & Jakicic, J. M. (2018). Reducing sedentary behaviour to decrease chronic low back pain : The stand back randomised trial. *Occupational and Environmental Medicine*, *75*(5), 321-327. https://doi.org/10.1136/oemed-2017-104732

Gibson, A.-M., Muggeridge, D. J., Hughes, A. R., Kelly, L., & Kirk, A. (2017). An examination of objectively-measured sedentary behavior and mental well-being in adults across week days and weekends. *PloS One*, *12*(9), e0185143. https://doi.org/10.1371/journal.pone.0185143

Gilson, N. D., Burton, N. W., Uffelen, J. G. Z. van, & Brown, W. J. (2011). Occupational sitting time : Employees? perceptions of health risks and intervention strategies. *Health Promotion Journal of Australia*, *22*(1), 38-43. https://doi.org/10.1071/he11038

Gorely, T., & Ryde, G. (2018). Sedentary Behaviour and the Social and Physical Environment. In M. F. Leitzmann, C. Jochem, & D. Schmid (Éds.), *Sedentary Behaviour Epidemiology* (p. 545-564). Springer International Publishing. https://doi.org/10.1007/978-3-319-61552-3_24

Greene, R. D., Frey, M., Attarsharghi, S., Snow, J. C., Barrett, M., & Carvalho, D. D. (2019). Transient perceived back pain induced by prolonged sitting in a backless office chair : Are biomechanical factors involved? *Ergonomics*, *62*(11), 1415-1425. https://doi.org/10.1080/00140139.2019.1661526

GRIMSRUD, T. M. (1990). Humans were not created to sit—And why you have to refurnish your life. *Ergonomics*, *33*(3), 291-295. https://doi.org/10.1080/00140139008927127

Gupta, N., Hallman, D. M., Mathiassen, S. E., Aadahl, M., Jørgensen, M. B., & Holtermann, A. (2016). Are temporal patterns of sitting associated with obesity among blue-collar workers? A cross sectional study using accelerometers. *BMC Public Health*, *16*(1), 148. https://doi.org/10.1186/s12889-016-2803-9

Hadgraft, N. T., Dunstan, D. W., & Owen, N. (2018). Models for Understanding Sedentary Behaviour. In M. F. Leitzmann, C. Jochem, & D. Schmid (Éds.), *Sedentary Behaviour Epidemiology* (p. 381-403). Springer International Publishing. https://doi.org/10.1007/978-3-319-61552-3_15

Hadgraft, N. T., Healy, G. N., Owen, N., Winkler, E. A. H., Lynch, B. M., Sethi, P., Eakin, E. G., Moodie, M., LaMontagne, A. D., Wiesner, G., Willenberg, L., & Dunstan, D. W. (2016). Office workers' objectively assessed total and prolonged sitting time : Individual-level correlates and worksite variations. *Preventive Medicine Reports*, *4*, 184-191. https://doi.org/10.1016/j.pmedr.2016.06.011

Hajnal, A., Clark, J. D., Doyon, J. K., & Kelty-Stephen, D. G. (2018). Fractality of body movements predicts perception of affordances : Evidence from stand-on-ability judgments about slopes. *Journal of Experimental Psychology. Human Perception and Performance*, *44*(6), 836-841. https://doi.org/10.1037/xhp0000510

Hajnal, A., Surber, T., Overstreet, T., Masoner, H., Dowell, C., Funkhouser, A., Shelley-Tremblay, J., & Samu, K. (2022). Complex Postural Sway is Related to Perception of Stand-on-Ability. *Ecological Psychology*, *0*(0), 1-18. https://doi.org/10.1080/10407413.2022.2035225

Halim, I., & Omar, A. R. (2011). *A REVIEW ON HEALTH EFFECTS ASSOCIATED WITH PROLONGED STANDING IN THE INDUSTRIAL WORKPLACES*. Undefined. /paper/A-REVIEW-ON-HEALTH-EFFECTS-ASSOCIATED-WITH-STANDING-Halim-Omar/ae7ed4d44c7e8760a211257d4db29bcb811864d6

Hamer, M., Coombs, N., & Stamatakis, E. (2014). Associations between objectively assessed and self-reported sedentary time with mental health in adults : An analysis of data from the Health Survey for England. *BMJ Open*, *4*(3), e004580. https://doi.org/10.1136/bmjopen-2013-004580

Harcourt-Smith, W. H. E. (2010). The First Hominins and the Origins of Bipedalism. *Evolution: Education and Outreach*, *3*(3), 333-340. https://doi.org/10.1007/s12052-010-0257-6

Healy, G. N., Matthews, C. E., Dunstan, D. W., Winkler, E. A. H., & Owen, N. (2011). Sedentary time and cardio-metabolic biomarkers in US adults : NHANES 2003-06. *European Heart Journal*, *32*(5), 590-597. https://doi.org/10.1093/eurheartj/ehq451

Hendriksen, I. J. M., Bernaards, C. M., Steijn, W. M. P., & Hildebrandt, V. H. (2016). Longitudinal Relationship Between Sitting Time on a Working Day and Vitality, Work Performance, Presenteeism, and Sickness Absence. *Journal of Occupational and Environmental Medicine*, *58*(8), 784-789. https://doi.org/10.1097/JOM.0000000000000809

Hosteng, K. R., Reichter, A. P., Simmering, J. E., & Carr, L. J. (2019). Uninterrupted Classroom Sitting is Associated with Increased Discomfort and Sleepiness Among College Students. *International Journal of Environmental Research and Public Health*, *16*(14), Art. 14. https://doi.org/10.3390/ijerph16142498

Ivanenko, Y., & Gurfinkel, V. S. (2018). Human Postural Control. *Frontiers in Neuroscience*, *12*. https://doi.org/10.3389/fnins.2018.00171

Jeal, N., & Salisbury, C. (2013). Protecting the health of sex workers : Will the real agenda please stand up. *Postgraduate Medical Journal*, *89*(1053), 369-370. https://doi.org/10.1136/postgradmedj-2012-131336

Jochem, C., Schmid, D., & Leitzmann, M. F. (2018). Introduction to Sedentary Behaviour Epidemiology. In M. F. Leitzmann, C. Jochem, & D. Schmid (Éds.), *Sedentary Behaviour Epidemiology* (p. 3-29). Springer International Publishing. https://doi.org/10.1007/978-3-319-61552-3_1

Jonas, K. J., Cesario, J., Alger, M., Bailey, A. H., Bombari, D., Carney, D., Dovidio, J. F., Duffy, S., Harder, J. A., van Huistee, D., Jackson, B., Johnson, D. J., Keller, V. N., Klaschinski, L., LaBelle, O., LaFrance, M., M. Latu, I., Morssinkhoff, M., Nault, K., … Tybur, J. M. (2017). Power poses – where do we stand? *Comprehensive Results in Social Psychology*, *2*(1), 139-141. https://doi.org/10.1080/23743603.2017.1342447

Jones, R., Credeur, D., & McCoy, S. (2019). Too Much Workplace Sitting : A Brief Historical Perspective. *International Journal of Exercise Science*, *12*(2), 777-785. https://digitalcommons.wku.edu/ijes/vol12/iss2/19

Kar, G., & Hedge, A. (2016b). Effects of Sitting and Standing Work Postures on Short-Term Typing Performance and Discomfort. *Proceedings of the Human Factors and Ergonomics Society Annual Meeting*, *60*(1), 460-464. https://doi.org/10.1177/1541931213601104

Karakolis, T., & Callaghan, J. P. (2014). The impact of sit-stand office workstations on worker discomfort and productivity : A review. *Applied Ergonomics*, *45*(3), 799-806. https://doi.org/10.1016/j.apergo.2013.10.001

Katzmarzyk, P. T. (2014). Standing and mortality in a prospective cohort of Canadian adults. *Medicine and Science in Sports and Exercise*, *46*(5), 940-946. https://doi.org/10.1249/MSS.0000000000000198

Katzmarzyk, P. T., Powell, K. E., Jakicic, J. M., Troiano, R. P., Piercy, K., Tennant, B., & 2018 PHYSICAL ACTIVITY GUIDELINES ADVISORY COMMITTEE*. (2019). Sedentary Behavior and Health : Update from the 2018 Physical Activity Guidelines Advisory Committee. *Medicine and Science in Sports and Exercise*, *51*(6), 1227-1241. https://doi.org/10.1249/MSS.0000000000001935

Labonté-LeMoyne, E., Jutras, M.-A., Léger, P.-M., Sénécal, S., Fredette, M., Begon, M., & Mathieu, M.-È. (2020). Does Reducing Sedentarity With Standing Desks Hinder Cognitive Performance? *Human Factors*, *62*(4), 603-612. https://doi.org/10.1177/0018720819879310

Landais, L. L., Damman, O. C., Schoonmade, L. J., Timmermans, D. R. M., Verhagen, E. A. L. M., & Jelsma, J. G. M. (2020). Choice architecture interventions to change physical activity and sedentary behavior : A systematic review of effects on intention, behavior and health outcomes during and after intervention. *International Journal of Behavioral Nutrition and Physical Activity*, *17*(1), 47. https://doi.org/10.1186/s12966-020-00942-7

Latash, M. L. (2008). *Synergy*. Oxford University Press.

Lee, I.-M., Shiroma, E. J., Lobelo, F., Puska, P., Blair, S. N., & Katzmarzyk, P. T. (2012). Effect of physical inactivity on major non-communicable diseases worldwide : An analysis of burden of disease and life expectancy. *The Lancet*, *380*(9838), 219-229. https://doi.org/10.1016/S0140-6736(12)61031-9

Levine, J. A. (2010). Health-chair reform : Your chair: comfortable but deadly. *Diabetes*, *59*(11), 2715-2716. https://doi.org/10.2337/db10-1042

Levine, J. A. (2015). Sick of sitting. *Diabetologia*, *58*(8), 1751-1758. https://doi.org/10.1007/s00125-015-3624-6

Lovejoy, C. O. (1988). Evolution of Human Walking. *Scientific American*, *259*(5), 118-125. JSTOR.

Lovejoy, C. O. (2005a). The natural history of human gait and posture. Part 1. Spine and pelvis. *Gait & Posture*, *21*(1), 95-112. https://doi.org/10.1016/j.gaitpost.2004.01.001

Lovejoy, C. O. (2005b). The natural history of human gait and posture. Part 2. Hip and thigh. *Gait & Posture*, *21*(1), 113-124. https://doi.org/10.1016/j.gaitpost.2004.06.010

Loyen, A., Clarke-Cornwell, A. M., Anderssen, S. A., Hagströmer, M., Sardinha, L. B., Sundquist, K., Ekelund, U., Steene-Johannessen, J., Baptista, F., Hansen, B. H., Wijndaele, K., Brage, S., Lakerveld, J., Brug, J., & van der Ploeg, H. P. (2017). Sedentary Time and Physical Activity Surveillance Through Accelerometer Pooling in Four European Countries. *Sports Medicine (Auckland, N.Z.)*, *47*(7), 1421-1435. https://doi.org/10.1007/s40279-016-0658-y

Magnon, V., Vallet, G. T., & Auxiette, C. (2018). Sedentary Behavior at Work and Cognitive Functioning : A Systematic Review. *Frontiers in Public Health*, *6(239), 1-14*. https://doi.org/10.3389/fpubh.2018.00239

Maher, J., & Dunton, G. (2019). Dual-process model of older adults' sedentary behavior : An ecological momentary assessment study. *Psychology & Health*, *35*, 1-19. https://doi.org/10.1080/08870446.2019.1666984

Maher, J. P., & Dunton, G. F. (2020). Within-day time-varying associations between motivation and movement-related behaviors in older adults. *Psychology of Sport and Exercise*, 35(5):519-537. https://doi.org/10.1016/j.psychsport.2019.04.012

Maltagliati, S., Sarrazin, P., Isoard-Gautheur, S., Rhodes, R. E., Boisgontier, M. P., & Cheval, B. (2021). I Sit but I Don't Know Why : Investigating the Multiple Precursors of Leisure-Time Sedentary Behaviors. *Research Quarterly for Exercise and Sport*, 93(3), 548-563. https://doi.org/10.1080/02701367.2021.1877246

Mark, L. S., Balliett, J. A., Craver, K. D., Douglas, S. D., & Fox, T. (1990). What an Actor Must Do in Order to Perceive the Affordance for Sitting. *Ecological Psychology*, *2*(4), 325-366. https://doi.org/10.1207/s15326969eco0204_2

Masoner, H., Hajnal, A., Clark, J. D., Dowell, C., Surber, T., Funkhouser, A., Doyon, J., Legradi, G., Samu, K., & Wagman, J. B. (2020). Complexity of postural sway affects affordance perception of reachability in virtual reality. *Quarterly Journal of Experimental Psychology*, *73*(12), 2362-2375. https://doi.org/10.1177/1747021820943757

Matthews, C. E., Chen, K. Y., Freedson, P. S., Buchowski, M. S., Beech, B. M., Pate, R. R., & Troiano, R. P. (2008). Amount of time spent in sedentary behaviors in the United States, 2003-2004. *American Journal of Epidemiology*, *167*(7), 875-881. https://doi.org/10.1093/aje/kwm390

Melvin, A., Elliott, C. G., Bang, F., Roberts, K. C., Thompson, W., & Prince, S. A. (2020). Population health measurement of social norms for sedentary behaviour : A systematic review. *Psychology of Sport and Exercise*, *47*, 101631. https://doi.org/10.1016/j.psychsport.2019.101631

Meyer, J., McDowell, C., Lansing, J., Brower, C., Smith, L., Tully, M., & Herring, M. (2020). *Changes in physical activity and sedentary behaviour due to the COVID-19 outbreak and associations with mental health in 3,052 US adults, 18(5251), 1-10*. https://doi.org/10.33774/coe-2020-h0b8g

Michie, S., van Stralen, M. M., & West, R. (2011). The behaviour change wheel : A new method for characterising and designing behaviour change interventions. *Implementation Science*, *6*(1), 42. https://doi.org/10.1186/1748-5908-6-42

Mitra, S. (2003). Postural costs of suprapostural task load. *Human Movement Science*, *22*(3), 253-270. https://doi.org/10.1016/S0167-9457(03)00052-6

Mitra, S., & Fraizer, E. V. (2004). Effects of explicit sway-minimization on postural–suprapostural dual-task performance. *Human Movement Science*, *23*(1), 1-20. https://doi.org/10.1016/j.humov.2004.03.003

Mitra, S., Knight, A., & Munn, A. (2013). Divergent effects of cognitive load on quiet stance and task-linked postural coordination. *Journal of Experimental Psychology: Human Perception and Performance*, *39*(2), 323-328. https://doi.org/10.1037/a0030588

Munir, F., Houdmont, J., Clemes, S., Wilson, K., Kerr, R., & Addley, K. (2015). Work engagement and its association with occupational sitting time : Results from the Stormont study. *BMC Public Health*, *15*(1), 30. https://doi.org/10.1186/s12889-015-1427-9

Navon, D., & Miller, J. (1987). Role of outcome conflict in dual-task interference. *Journal of Experimental Psychology. Human Perception and Performance*, *13*(3), 435-448. https://doi.org/10.1037//0096-1523.13.3.435

Ng, S. W., & Popkin, B. (2012). Time Use and Physical Activity : A Shift Away from Movement across the Globe. *Obesity Reviews*, *13*(8), 659-680. https://doi.org/10.1111/j.1467-789X.2011.00982.x

O'Donoghue, G., Perchoux, C., Mensah, K., Lakerveld, J., van der Ploeg, H., Bernaards, C., Chastin, S. F. M., Simon, C., O'Gorman, D., Nazare, J.-A., & on behalf of the DEDIPAC consortium. (2016). A systematic review of correlates of sedentary behaviour in adults aged 18–65 years : A socio-ecological approach. *BMC Public Health*, *16*(1), 163. https://doi.org/10.1186/s12889-016-2841-3

Owen, N., Healy, G. N., Dempsey, P. C., Salmon, J., Timperio, A., Clark, B. K., Goode, A. D., Koorts, H., Ridgers, N. D., Hadgraft, N. T., Lambert, G., Eakin, E. G., Kingwell, B. A., & Dunstan, D. W. (2020). Sedentary Behavior and Public Health : Integrating the Evidence and Identifying Potential Solutions. *Annual Review of Public Health*, *41*, 265-287. https://doi.org/10.1146/annurev-publhealth-040119-094201

Owen, N., Healy, G. N., Matthews, C. E., & Dunstan, D. W. (2010). Too Much Sitting : The Population-Health Science of Sedentary Behavior. *Exercise and Sport Sciences Reviews*, *38*(3), 105-113. https://doi.org/10.1097/JES.0b013e3181e373a2

Owen, N., Sugiyama, T., Eakin, E. E., Gardiner, P. A., Tremblay, M. S., & Sallis, J. F. (2011). Adults' Sedentary Behavior : Determinants and Interventions. *American Journal of Preventive Medicine*, *41*(2), 189-196. https://doi.org/10.1016/j.amepre.2011.05.013

Palatinus, Z., Dixon, J. A., & Kelty-Stephen, D. G. (2013). Fractal fluctuations in quiet standing predict the use of mechanical information for haptic perception. *Annals of Biomedical Engineering*, *41*(8), 1625-1634. https://doi.org/10.1007/s10439-012-0706-1

Palatinus, Z., Kelty-Stephen, D. G., Kinsella-Shaw, J., Carello, C., & Turvey, M. T. (2014). Haptic perceptual intent in quiet standing affects multifractal scaling of postural fluctuations. *Journal of Experimental Psychology: Human Perception and Performance*, *40*(5), 1808-1818. https://doi.org/10.1037/a0037247

Patterson, R., McNamara, E., Tainio, M., de Sá, T. H., Smith, A. D., Sharp, S. J., Edwards, P., Woodcock, J., Brage, S., & Wijndaele, K. (2018). Sedentary behaviour and risk of all-cause, cardiovascular and cancer mortality, and incident type 2 diabetes : A systematic review and dose response meta-analysis. *European Journal of Epidemiology*, *33*(9), 811-829. https://doi.org/10.1007/s10654-018-0380-1

Pitanga, F. J. G., Beck, C. C., Pitanga, C. P. S., Pitanga, F. J. G., Beck, C. C., & Pitanga, C. P. S. (2020). Physical Activity And Reducing Sedentary Behavior During The Coronavirus Pandemic. *Arquivos Brasileiros de Cardiologia*, *AHEAD.*, 114(6), 1-3. https://doi.org/10.36660/abc.2020023

Power Posing : Brief Nonverbal Displays Affect Neuroendocrine Levels and Risk Tolerance—Dana R. Carney, Amy J.C. Cuddy, Andy J. Yap, 2010. (s. d.). Consulté 8 mai 2020, à l'adresse https://journals.sagepub.com/doi/abs/10.1177/0956797610383437

Prang, T. C. (2019). The African ape-like foot of Ardipithecus ramidus and its implications for the origin of bipedalism. *eLife*, *8*, e44433. https://doi.org/10.7554/eLife.44433

Prince, S. A., Cardilli, L., Reed, J. L., Saunders, T. J., Kite, C., Douillette, K., Fournier, K., & Buckley, J. P. (2020). A comparison of self-reported and device measured sedentary behaviour in adults : A systematic review and meta-analysis. *International Journal of Behavioral Nutrition and Physical Activity*, *17*(1), 31. https://doi.org/10.1186/s12966-020-00938-3

Pruimboom, L. (2011). Physical inactivity is a disease synonymous for a non-permissive brain disorder. *Medical Hypotheses*, *77*(5), 708-713. https://doi.org/10.1016/j.mehy.2011.07.022

Puig-Ribera, A., Martínez-Lemos, I., Giné-Garriga, M., González-Suárez, Á. M., Bort-Roig, J., Fortuño, J., Muñoz-Ortiz, L., McKenna, J., & Gilson, N. D. (2015). Self-reported sitting time and physical activity : Interactive associations with mental well-being and productivity in office employees. *BMC Public Health*, *15*(1), 72. https://doi.org/10.1186/s12889-015-1447-5

Raichlen, D. A., Pontzer, H., Zderic, T. W., Harris, J. A., Mabulla, A. Z. P., Hamilton, M. T., & Wood, B. M. (2020). Sitting, squatting, and the evolutionary biology of human inactivity. *Proceedings of the National Academy of Sciences*, *117*(13), 7115-7121. https://doi.org/10.1073/pnas.1911868117

Rangul, V., Sund, E. R., Mork, P. J., Røe, O. D., & Bauman, A. (2018). The associations of sitting time and physical activity on total and site-specific cancer incidence : Results from the HUNT study, Norway. *PLOS ONE*, *13*(10), e0206015. https://doi.org/10.1371/journal.pone.0206015

Remaud, A., Boyas, S., Caron, G. A. R., & Bilodeau, M. (2012). Attentional Demands Associated With Postural Control Depend on Task Difficulty and Visual Condition. *Journal of Motor Behavior*, *44*(5), 329-340. https://doi.org/10.1080/00222895.2012.708680

Rhodes, R. E., McEwan, D., & Rebar, A. L. (2019). Theories of physical activity behaviour change : A history and synthesis of approaches. *Psychology of Sport and Exercise*, *42*, 100-109. https://doi.org/10.1016/j.psychsport.2018.11.010

Riccio, G. E., & Stoffregen, T. A. (1988). Affordances as constraints on the control of stance. *Human Movement Science*, *7*(2), 265-300. https://doi.org/10.1016/0167-9457(88)90014-0

Roerdink, M., Hlavackova, P., & Vuillerme, N. (2011). Center-of-pressure regularity as a marker for attentional investment in postural control : A comparison between sitting and standing postures. *Human Movement Science*, *30*(2), 203-212. https://doi.org/10.1016/j.humov.2010.04.005

Rosenbaum, D., Mama, Y., & Algom, D. (2017). Stand by Your Stroop : Standing Up Enhances Selective Attention and Cognitive Control. *Psychological Science*, *28*(12), 1864-1867. https://doi.org/10.1177/0956797617721270

Rosenberger, M. (2012). Sedentary behavior : Target for change, challenge to assess. *International Journal of Obesity Supplements*, *2*(Suppl 1), S26-S29. https://doi.org/10.1038/ijosup.2012.7

Saidj, M., Menai, M., Charreire, H., Weber, C., Enaux, C., Aadahl, M., Kesse-Guyot, E., Hercberg, S., Simon, C., & Oppert, J.-M. (2015). Descriptive study of sedentary behaviours in 35,444 French working adults : Cross-sectional findings from the ACTI-Cités study. *BMC Public Health*, *15*(1), 379. https://doi.org/10.1186/s12889-015-1711-8

Schneider, W., & Chein, J. M. (2003). Controlled & automatic processing : Behavior, theory, and biological mechanisms. *Cognitive Science*, *27*(3), 525-559. https://doi.org/10.1016/S0364-0213(03)00011-9

Schneider, W., & Shiffrin, R. M. (1977). Controlled and automatic human information processing : I. Detection, search, and attention. *Psychological Review*, *84*(1), 1-66. https://doi.org/10.1037/0033-295X.84.1.1

Shaikh, A. S., & Shelke, R. D. (2016). *Studies Assessing the Effects of Prolonged Standing at Work : A Review*. *5-10, 18179-18185*. https://doi.org.10.15680/IJIRSET.2016.0510131

Sheeran, P., & Webb, T. L. (2016). The Intention–Behavior Gap. *Social and Personality Psychology Compass*, *10*(9), 503-518. https://doi.org/10.1111/spc3.12265

Shiffrin, R. M., & Schneider, W. (1977). Controlled and automatic human information processing : II. Perceptual learning, automatic attending and a general theory. *Psychological Review*, *84*(2), 127-190. https://doi.org/10.1037/0033-295X.84.2.127

Sjögren, P., Fisher, R., Kallings, L., Svenson, U., Roos, G., & Hellénius, M.-L. (2014). Stand up for health—avoiding sedentary behaviour might lengthen your telomeres : Secondary outcomes from a physical activity RCT in older people. *British Journal of Spforts Medicine*, *48*(19), 1407-1409. https://doi.org/10.1136/bjsports-2013-093342

Smith, K. C., Davoli, C. C., Knapp, W. H., & Abrams, R. A. (2019). Standing enhances cognitive control and alters visual search. *Attention, Perception, & Psychophysics*, *81*(7), 2320-2329. https://doi.org/10.3758/s13414-019-01723-6

Smith, L., Hamer, M., Ucci, M., Marmot, A., Gardner, B., Sawyer, A., Wardle, J., & Fisher, A. (2015). Weekday and weekend patterns of objectively measured sitting, standing, and stepping in a sample of office-based workers : The active buildings study. *BMC Public Health*, *15*(1), 9. https://doi.org/10.1186/s12889-014-1338-1

Sniehotta, F. F., Araújo-Soares, V., Brown, J., Kelly, M. P., Michie, S., & West, R. (2017). Complex systems and individual-level approaches to population health : A false dichotomy? *The Lancet Public Health*, *2*(9), e396-e397. https://doi.org/10.1016/S2468-2667(17)30167-6

Speakman, J. R. (2020). An Evolutionary Perspective on Sedentary Behavior. *BioEssays: News and Reviews in Molecular, Cellular and Developmental Biology*, *42*(1), e1900156. https://doi.org/10.1002/bies.201900156

Stamatakis, E., Coombs, N., Rowlands, A., Shelton, N., & Hillsdon, M. (2014). Objectively-assessed and self-reported sedentary time in relation to multiple socioeconomic status indicators among adults in England : A cross-sectional study. *BMJ Open*, *4*(11), e006034. https://doi.org/10.1136/bmjopen-2014-006034

Stamatakis, E., Ekelund, U., Ding, D., Hamer, M., Bauman, A. E., & Lee, I.-M. (2019). Is the time right for quantitative public health guidelines on sitting? A narrative review of sedentary behaviour research paradigms and findings. *British Journal of Sports Medicine*, *53*(6), 377-382. https://doi.org/10.1136/bjsports-2018-099131

Stanczykiewicz, B., Banik, A., Knoll, N., Keller, J., Hohl, D. H., Rosińczuk, J., & Luszczynska, A. (2019). Sedentary behaviors and anxiety among children, adolescents and adults : A systematic review and meta-analysis. *BMC Public Health*, *19*(1), 459. https://doi.org/10.1186/s12889-019-6715-3

Stephan, D. N., Hensen, S., Fintor, E., Krampe, R., & Koch, I. (2018). Influences of Postural Control on Cognitive Control in Task Switching. *Frontiers in Psychology*, *9*, 1153. https://doi.org/10.3389/fpsyg.2018.01153

Stoffregen, T. A., Smart, L. J., Bardy, B. G., & Pagulayan, R. J. (1999). Postural stabilization of looking. *Journal of Experimental Psychology: Human Perception and Performance*, *25*(6), 1641-1658. https://doi.org/10.1037/0096-1523.25.6.1641

Stoffregen, T. A., Yoshida, K., Villard, S., Scibora, L., & Bardy, B. G. (2010). Stance Width Influences Postural Stability and Motion Sickness. *Ecological Psychology*, *22*(3), 169-191. https://doi.org/10.1080/10407413.2010.496645

Straub, E. R., Dames, H., Kiesel, A., & Dignath, D. (2022). Does body posture reduce the Stroop effect? Evidence from two conceptual replications and a meta-analysis. *Acta Psychologica*, *224*, 103497. https://doi.org/10.1016/j.actpsy.2022.103497

Sui, W., Smith, S. T., Fagan, M. J., Rollo, S., & Prapavessis, H. (2019). The effects of sedentary behaviour interventions on work-related productivity and performance outcomes in real and simulated office work : A systematic review. *Applied Ergonomics*, *75*, 27-73. https://doi.org/10.1016/j.apergo.2018.09.002

Thorp, A. A., Healy, G. N., Winkler, E., Clark, B. K., Gardiner, P. A., Owen, N., & Dunstan, D. W. (2012). Prolonged sedentary time and physical activity in workplace and non-work contexts : A cross-sectional study of office, customer service and call centre employees. *International Journal of Behavioral Nutrition and Physical Activity*, *9*(1), 128. https://doi.org/10.1186/1479-5868-9-128

Tigbe, W. W., Lean, M. E. J., & Granat, M. H. (2011). A physically active occupation does not result in compensatory inactivity during out-of-work hours. *Preventive Medicine*, *53*(1-2), 48-52. https://doi.org/10.1016/j.ypmed.2011.04.018

Tremblay, M. S., Aubert, S., Barnes, J. D., Saunders, T. J., Carson, V., Latimer-Cheung, A. E., Chastin, S. F. M., Altenburg, T. M., Chinapaw, M. J. M., Altenburg, T. M., Aminian, S., Arundell, L., Atkin, A. J., Aubert, S., Barnes, J., Barone Gibbs, B., Bassett-Gunter, R., Belanger, K., Biddle, S., … on behalf of SBRN Terminology Consensus Project Participants. (2017). Sedentary Behavior Research Network (SBRN) – Terminology Consensus Project process and outcome. *International Journal of Behavioral Nutrition and Physical Activity*, *14*(1), 75. https://doi.org/10.1186/s12966-017-0525-8

Trinkaus, E. (1975). Squatting among the neandertals : A problem in the behavioral interpretation of skeletal morphology. *Journal of Archaeological Science*, *2*(4), 327-351. https://doi.org/10.1016/0305-4403(75)90005-9

Uffelen, J. G. Z. van, Heesch, K. C., & Brown, W. (2012). Correlates of Sitting Time in Working Age Australian Women : Who Should Be Targeted With Interventions to Decrease Sitting Time? *Journal of Physical Activity and Health*, *9*(2), 270-287. https://doi.org/10.1123/jpah.9.2.270

Vallance, J. K., Winkler, E. A. H., Gardiner, P. A., Healy, G. N., Lynch, B. M., & Owen, N. (2011). Associations of objectively-assessed physical activity and sedentary time with depression : NHANES (2005-2006). *Preventive Medicine*, *53*(4-5), 284-288. https://doi.org/10.1016/j.ypmed.2011.07.013

Vandelanotte, C., Duncan, M. J., Short, C., Rockloff, M., Ronan, K., Happell, B., & Di Milia, L. (2013). Associations between occupational indicators and total, work-based and leisure-time sitting : A cross-sectional study. *BMC Public Health*, *13*(1), 1110. https://doi.org/10.1186/1471-2458-13-1110

van Dommelen, P., Coffeng, J. K., van der Ploeg, H. P., van der Beek, A. J., Boot, C. R. L., & Hendriksen, I. J. M. (2016). Objectively Measured Total and Occupational Sedentary Time in Three Work Settings. *PloS One*, *11*(3), e0149951. https://doi.org/10.1371/journal.pone.0149951

Venema, T. A. G., Kroese, F. M., & De Ridder, D. T. D. (2018). I'm still standing : A longitudinal study on the effect of a default nudge. *Psychology & Health*, *33*(5), 669-681. https://doi.org/10.1080/08870446.2017.1385786

Verhavert, Y., De Martelaer, K., Van Hoof, E., Van Der Linden, E., Zinzen, E., & Deliens, T. (2020). The Association between Energy Balance-Related Behavior and Burn-Out in Adults : A Systematic Review. *Nutrients*, *12*(2). https://doi.org/10.3390/nu12020397

Vette, A. H., Masani, K., Sin, V., & Popovic, M. R. (2010). Posturographic measures in healthy young adults during quiet sitting in comparison with quiet standing. *Medical Engineering & Physics*, *32*(1), 32-38. https://doi.org/10.1016/j.medengphy.2009.10.005

Vuillerme, N., & Nougier, V. (2004). Attentional demand for regulating postural sway : The effect of expertise in gymnastics. *Brain Research Bulletin*, *63*(2), 161-165. https://doi.org/10.1016/j.brainresbull.2004.02.006

Wall, R., Läubli, T., Seibt, R., Rieger, M. A., & Steinhilber, B. (2019). Associations between low back muscle activity, pelvic movement and low back discomfort development during prolonged standing – An exploratory laboratory study. *International Journal of Industrial Ergonomics*, *72*, 380-389. https://doi.org/10.1016/j.ergon.2019.07.001

Wang, X., Li, Y., & Fan, H. (2019). The associations between screen time-based sedentary behavior and depression : A systematic review and meta-analysis. *BMC Public Health*, *19*(1), 1524. https://doi.org/10.1186/s12889-019-7904-9

Waongenngarm, P., Rajaratnam, B. S., & Janwantanakul, P. (2015). Perceived body discomfort and trunk muscle activity in three prolonged sitting postures. *Journal of Physical Therapy Science*, *27*(7), 2183-2187. https://doi.org/10.1589/jpts.27.2183

Woollacott, M., & Shumway-Cook, A. (2002). Attention and the control of posture and gait : A review of an emerging area of research. *Gait & Posture*, *16*(1), 1-14. https://doi.org/10.1016/S0966-6362(01)00156-4