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Running head: Physical activity and employees' affective well-being

**Benefits of a Brief Physical Activity Programme on Employees' Affective Well-being and
Momentary Affective States: A quasi-experimental study**

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Abstract

The present study examined the effects of a four-week physical activity (PA) programme on employees' general affective well-being the acute effects of fitness and stretching sessions on momentary affective states. Participants were divided between an experimental ($n = 54$) and a comparison group ($n = 57$). After one month, only employees in the experimental group increased their general affective well-being. Moreover, momentary positive affective states were significantly higher after PA sessions, especially after fitness sessions. For both activities, momentary negative affect significantly decreased after PA sessions, with a larger reduction in the levels of high-activated unpleasant affect. In the short and middle terms, brief PA programmes seem relevant to enhance employees' affective well-being. PA programme characteristics are finally discussed.

Keywords: Psychological well-being; affective states; physical activity; organizational interventions; work

1. Introduction

According to a recent French National Research and Safety Institute (2016) survey of 28,000 workers from all occupational categories, only 46% feel fulfilled, 25% regularly hide their emotions at work and pretend to be in a good mood, 50% report interacting with individuals in distress or needing to be calmed down, and 21% to 44% report tensed working situations (Beque, Kingsada, & Mauroux, 2019; Coutrot, 2018). Such findings highlight the challenges for working people to maintain a good mental health, defined as “a state of well-being in which the individual realises his or her own abilities, can cope with the normal stresses of life, can work productively and fruitfully, and is able to make a contribution to his or her community” (World Health Organization, 2004).

Well-being is a multi-faceted construct referring to optimal psychological functioning and experience (Ryan & Deci, 2001). This concept has been extensively studied across hedonic and eudaimonic perspectives. In the hedonic approach that focusses on happiness (Diener, 1984; Kahneman et al., 1999), subjective well-being encompasses affective (i.e., momentary positive and negative affective states that occur at different frequencies and intensities through time) and cognitive (i.e., life or life-specific domains satisfaction) components. Regarding the eudaimonic approach of well-being (Ryan & Deci, 2001) also known as psychological well-being, well-being refers to self-fulfillment and relates on one's resources and strengths, as well as on life meaning, authenticity, and purposefulness (Waterman et al., 2010). Even if affects are not at the core of eudaimonia, both concepts appear correlated (Di Fabio & Palazzeschi, 2015; Huta & Ryan, 2010).

Affective states have been defined as states that are accessible to the consciousness (such as feelings) varying over time along two fundamental dimensions: Valence (i.e., positive–negative) and arousal (i.e., high–low activation; Yik, Russell, & Steiger, 2011). Hence, they may be characterised in terms of high-activated positive affect (HAPA; e.g., excited), low-activated positive affect (LAPA; e.g., peaceful), low-activated negative affect

(LAUA; e.g., bored), and high-activated negative affect (HAUA; e.g., anxious). A positive ratio of positive to negative affect, is positively associated with mental health status (Diehl, Hay, & Berg, 2011). According to the broaden-and-build theory (Fredrickson, 2001), individuals who experience frequent positive emotions broaden their thought-action repertoire that enable them to build psychological resources. Affect and affect regulation strategies reciprocally influence one another in such a way that positive affect enhances the use of adaptive affective regulation strategies (e.g., problem-focused coping or cognitive reappraisal) which in turn rise positive affect (Garland, Gaylord, & Fredrickson, 2011; Pavani, Le Vigouroux, Kop, Congard, & Dauvier, 2015). In the context of work, positive affect is positively related to job satisfaction, job performance (Lyubomirsky, King, & Diener, 2005; Wright & Cropanzano, 2000), and work engagement (Gillet, Becker, Lafrenière, Huart, & Fouquereau, 2017). In addition, a positive ratio of positive to negative affect is negatively related to cynicism and turnover (Ha, 2018). Although positive affect enables to buffer the effects from a large range of life's stressors (including work stressors) at a daily level (Leger, Charles, & Almeida, 2020), higher levels of negative affect and lower levels of positive affect are reported when experiencing higher levels of perceived stress (Wang, Schneider, Schwartz, & Stone, 2020). In the workplace, negative affect is positively related to productivity loss and emotional exhaustion (Ferreira, da Costa Ferreira, Cooper, & Oliveira, 2019), and negatively linked to job satisfaction (Kafetsios & Zampetakis, 2008). As such, considering positive and negative affect is of main importance for employees' flourishing as well as for managers.

Physical activity (PA) appears useful to enhance employees' general affective well-being as well as momentary affective states. On the one hand, longitudinal studies investigating the effect of PA practice on employees' mental health mainly focused on work-related indicators such as levels of burnout, stress, anxiety, and depression (Jonsdottir et al.,

2010; Lindwall, Gerber, Jonsdottir, Börjesson, & Ahlborg, 2014; de Vries et al., 2016) and did not assess affective well-being as a main outcome. Across one to four years, results from these studies report that workers being lightly to vigorously active or increasing their PA level across time are less likely than sedentary workers to report symptoms of stress, depression, and burnout, suggesting a better affective well-being. Only a few interventional studies have investigated the benefits of PA practice on employees' affective well-being as the main outcome in the workplace. Specifically, Hartfiel, Havenhand, Khalsa, Clarke, and Krayner (2011) found that after a six-week yoga programme, employees in the intervention group felt significantly more serene, less sad, and less hostile than those in the control group. In the same lines, Bretland and Thorsteinsson (2015) showed significant improvement in positive and negative affective states and emotional exhaustion after four weeks of PA practice.

On the other hand, results of daily studies reveal that PA's acute effect efficiently enhances employees' momentary positive affective states starting immediately after the practice and continuing for the next few hours (Feuerhahn, Sonnentag, & Woll, 2014; Ménard, Foucreault, Stevens, Trépanier, & Flaxman, 2017). Findings about PA's effect on momentary negative affective states are mixed, with some studies showing a decrease in negative affect following PA (Ménard et al., 2017; Puterman, Weiss, Beauchamp, Mogle, & Almeida, 2017) while others do not (Feuerhahn et al., 2014; Liao, Shonkoff, & Dunton, 2015). In the workplace, only a few interventional studies investigated the benefits of PA practice on employees' affective states. Specifically, Thøgersen-Ntoumani et al. (2015) showed that employees being involved in a 10-week walking programme experienced higher levels of enthusiasm and relaxation at work on afternoons when they carried out PA during their lunch breaks compared with days when they did not. Interestingly, de Vries et al. (2020) showed that pleasure experienced during PA sessions moderates the trajectories of health and

positive affect among employees involved in a six-week running programme. Finally, a recent narrative review emphasizes a positive relationship between acute affective responses to PA and the maintenance of active behaviours (Steven et al., 2020). Precisely, positive affective experiences during PA sessions increase subsequent PA behaviours among low active adults while negative affective experiences would decrease them. Even less is known about a larger influence of affective responses during versus after PA sessions, such effects seem in line with a perspective of hedonic motivations towards PA, in such a way that more positive (or less negative) affective responses during PA is associated with a greater likelihood of future PA behaviour (Steven et al., 2020).

Although relevant, these studies present shortcomings that need to be overcome.

First, although general affective well-being assessments and momentary affective states are complementary to examine the process through which the acute effects of PA sessions might account for the broader effects of a whole intervention (Russell & Daniel, 2018; de Vries et al., 2020), this consideration has received little interest. To date, no previous study has examined the benefits of a PA programme on employees' general affective well-being as well as on their momentary affective states. Regarding employees' mental health, Gerber et al. (2013) examined both timeframes in a pilot study investigating the effect of a twelve-week PA programme including two to three PA sessions per week on employees with high levels of burnout. Nevertheless, the beneficial acute effects of PA practice on momentary affective states momentary affective states were only assessed from before to after two PA sessions and for a half of participants. Considering the upward spiral of positive affective states on well-being (Fredrickson & Joiner, 2018) as well as the acute effect of PA sessions on affective states, both timeframes need to be further examined.

Furthermore, the duration of PA programmes can also be risen. When wishing to improve employees' affective well-being, intervention studies range from 4 to 12 weeks and

from 4 to 18 weeks for other work-related variables such as burnout (see Naczenski et al., 2017 for a review). To the best of our knowledge, only one intervention study relied on a four-week PA programme (Bretland & Thorsteinsson, 2015). Yet, short non-sporting interventions designed to improve affective well-being in employees such as positive psychology interventions (Rahm, Heise, & Schuldt, 2017), well-being games (Keeman, Näswall, Malinen, & Kuntz, 2017) or mindfulness (Pavani et al., 2020), show significant benefits from four weeks of practice. Considering the advantages employees and managers can reap from developing short efficient interventions, the promising results from Bretland and Thorsteinsson (2015) need to be replicated and extended with larger sample sizes.

Finally, results from these studies do not indicate if a particular type of PA or intensity of practice should be prioritised to optimize the benefits of PA sessions on subsequent momentary affective states. Previous studies found that light intensity PA such as walk and yoga (Hartfiel et al., 2012; Thøgersen-Ntoumani et al. 2015) as well as moderate-to-vigorous PA (e.g., moderate intensity continuous training and high intensity interval) increase HAPA and LAPA post-PA sessions (Oliveira, Santos, Kilpatrick, Pires, & Deslandes, 2018; Oliveira, Slama, Deslandes, Furtado, & Santos, 2013). Moreover, the level of effort weekly experienced during PA sessions did not significantly contribute to positive affect nor health-related trajectories among employees involved in a six-week running programme (de Vries et al. 2020). Nevertheless, moderate-to-vigorous PA intensity may have the disadvantage of generating negative affect due to demanding physiological adaptations (Oliveira et al., 2013; Oliveira et al., 2018). Since light to vigorous PA intensities are positively linked with subsequent positive affective states and because variety during PA sessions is associated with greater enjoyment (Juvancic-Heltzel, Glickman, & Barkley, 2013; Sylvester et al., 2014), varying the nature and intensities between PA sessions appear worthy to investigate when designing a short PA programme.

Therefore, the present study main aim was to examine the effects of a four-week PA programme on employees' general affective well-being as well as on momentary affective states. We hypothesized that employees who were involved in a four-week PA programme would see significant increases in their general affective well-being during a one-month period in comparison to a comparison group. We also assumed that both PAs would significantly increase momentary positive affective states (HAPA and LAPA) and decrease momentary negative affective states (HAUA and LAUA).

The second purpose was to investigate the acute effects of two different PAs with varied intensities of practice (i.e., fitness activities with a moderate-to-vigorous practice intensity, and stretching activities with a light practice intensity) on momentary affective states. However, we have left as an open research question whether these effects may vary as a function of the type of practice (fitness or stretching).

2. Materials and Methods

2.1. Participants and procedures

An a-priori test calculation for F tests (i.e., ANOVA: Repeated measures, within-between interaction) was run with GPower©. The test calculation was run for a small effect size of .17 (on the basis of previous study working in the benefits of PA on emotional exhaustion; de Vries et al., 2017), a threshold of significance at .05, a power of .90, two groups, two measurements, and a correlation of .50 across repeated measures, indicated a requested total sample size of 88. A rate of potential dropout was estimated at 20% per group. Therefore, a minimum of 53 participants had to be recruited per group. The study participants were 136 employees from five French service companies. The participants were divided into two groups: An experimental group composed of 79 tertiary employees (65 women and 14 men; $M_{age} = 40.10$ years old, $SD = 9.70$) and a comparison group composed of 57 tertiary employees (36 women and 21 men; $M_{age} = 37.72$ years old, $SD = 14.23$). The study design

was quasi-experimental since we could not reach for random assignments. Even experimental design would have been preferable, we faced time constraints due to four-week collaborations with our partner companies. In such a way, no waiting list of participants could have been provided. Therefore, employees interested in practicing PA two times a week during four weeks were included in the experimental group whereas employees interested in participating to the study without practicing PA were included in the comparison group.

All participants completed a four-week research programme that included the completion of online measures of general affective well-being one month apart. Participants from the experimental group had to reply to the general affective well-being measures within the respective week before and after the week of the PA programme to avoid overlapping between contextual and situational measures.

Over four weeks, the experimental group participated in a PA programme that included two PA sessions per week supervised by two sports educators. Participants in the comparison group did not modify their regular work schedules. PA sessions were programmed during the lunch break or at the end of the workday, depending on the companies' ability to accommodate the sessions. Each week, the PA programme included two 45-minute sessions that differed in terms of nature and intensity (i.e., moderate to vigorous intensity for the fitness activities and light intensity for the stretching activities). The fitness practice included various exercises such as muscular reinforcement exercises and circuit-training as well as collaborative and entertaining challenges. Meanwhile, the stretching practice was comprised of soft and relaxing exercises that stretched the muscles.

Participants' momentary affective states were assessed with visual analogue scales before and after each session. PA educators made sure all items were filled in each time. Prior to engaging in the PA programme, participants from the experimental group were informed about any health risks that might be associated with PA.

In order to be eligible for inclusion in the study, participants had to work at least 16 hours per week, and could not be involved in elite competitive sports activities nor having any known health issues such as chronic diseases or traumatic injuries. Finally, participants from the experimental group who could not complete a minimum of 75% of the PA sessions (i.e., six out of eight PA sessions, ensuring two completed sessions per activity type) were excluded from the analyses. This criterion was recently used by Nymberg et al. (2018), who assumed that a higher proportion of attendance enhances the effect of training. Twenty-five participants from the experimental group were excluded from the analyses. Informed consent was obtained from all participants who were included in the study. All procedures performed in the study were in accordance with the 1964 Helsinki Declaration and its amendments.

Companies interested in developing PA sessions within their organization were contacted by to co-investigators of the present study to introduce the research project and the PA programme.

Participants' recruitment was made in different steps. First, a collaboration was made between the two research laboratories and a company specialized in adapted physical activity whose aim is to develop and propose a large array of PA practices (e.g., fitness, stretching, nordic walking) adapted to various public including companies. Companies that accepted to collaborate communicated to their employees about the possibility for them to freely practice muscular reinforcement and stretching one time per week during four weeks as a pilot before considering a longer-term perspective. A letter of information was sent to the employees to introduce the company and the study, but also to answer to any questions about the nature of PA sessions and/or organizational aspects. At this occasion, they were also informed that a scientific project about the potential effects of the PA sessions on their general well-being would be conducted. Employees were informed that their managers did not order the study and that they were free to be part of the comparison or experimental group. Nevertheless,

employees who only wished to discover the practice via non-regular PA sessions were allowed to do it but were not included in the study. Employees were not pushed to participate neither by their director nor by the PA educators. There was no conflict of interest between our research laboratories and the different companies. Finally, and at managers and employees' requests, results from the experiment were communicated during meetings.

2.2 Measures

General affective well-being: The French version of the Scale of Positive and Negative Experience (SPANE; Martin-Krumm et al., 2017) was used to assess the frequency of participants' positive and negative affective feelings at the beginning and end of the programme. Participants were asked to indicate the extent to which they experienced 12 different general (i.e., pleasant, unpleasant, positive, negative) and specific (e.g., happy, joyful, contented, angry, sad, afraid) feelings during the last four weeks on a five-point unipolar Likert-scale ranging from 1 (*very rarely or never*) to 5 (*very often or always*). The SPANE allowed us to compute a score ranging from 6 to 30, representing positive and negative general affective well-being. The scale also facilitated the calculation of an affect balance score ranging from -24 to 24 by subtracting positive scale scores from negative scale scores. Cronbach's alphas were adequate for each affective scale at each assessment time (T1: Before the four-week programme and T2: Four weeks later): $\alpha_{\text{positive feelings_T1}} = .87$, $\alpha_{\text{positive feelings_T2}} = .88$, $\alpha_{\text{negative feelings_T1}} = .84$, and $\alpha_{\text{negative feelings_T2}} = .88$.

Momentary affective states: Before and after each PA session, participants in the experimental group were asked to indicate how they felt at the moment on visual analogue scales ranging from 0 (*not at all*) to 10 (*extremely*). Four affective states, equally distributed in terms of valence and arousal (i.e., joyful, satisfied, angry, and sad) were selected. These four items were respectively considered as HAPA, LAPA, HAUA, and LAUA. Such choices

relied on the basis of the Job-Related Affective Well-Being Scale (Van Katwick et al., 2000) that assesses affective states commonly experienced at work by employees.

2.3. Data analyses

Data were analysed using Jamovi[®] software and the General Analyses for Linear Models in Jamovi (GAMLj) module. Regarding general affective well-being analyses, normality tests (i.e., skewness coefficients and analyses of the residuals) revealed that only the affect balance score followed a normal distribution at T1 and T2. Therefore, a linear mixed-model analyses of variance (LMM) was chosen for the study of the affect balance score, while generalized linear mixed model analyses of variance (GLMM) were used for the respective studies of the positive and negative scales. For the positive and negative scales, analyses were performed with Gamma and Inverse Gaussian distributions that both constitute relevant functions to manage unimodal skewed distributions with continuous responses (Lo & Andrews, 2015). The use of the Gamma function was finally selected on the basis of the AIC criterion (Lo & Andrews, 2015). Each of the three models had two factors: Time (T1 and T2) and group (experimental and comparison groups), and random intercepts on the cluster variable (subjects). LMM and GLMM were selected since they take the hierarchical structure of the data into account (Noël, 2015). For LMM, pseudo- R^2 can be interpreted with the use of R-squared marginal corresponding to the variance explained by the fixed effects over the total expected variance of the dependent variable and the R-squared conditional corresponding to the variance explained by the fixed and the random effects together over the total (expected) variance of the dependent variable (Johnson, 2014). For GLMM, effect size can be reported with the odd ratio ($\exp(B)$) of the effects, that enables to interpret the effects in terms of rate of change in the dependent variable as the independent variable increases. General affective well-being analyses were conducted according to intention-to-treat (i.e., referring to the effect of treatment « as assigned » regardless of dropout or missing values)

and per-protocol (i.e., referring to the effect of treatment « as received », in our case excluding participants who had less than 75% adherence rate to the PA programme) principles.

A second set of analyses was performed on the data from participants in the experimental group that reached the compliance rate to assess PA sessions' situational effects on momentary affective states. Normality analyses revealed that all the within-subjects conditions for momentary positive affective states followed a normal distribution but that momentary negative affective states' distributions were skewed for almost all conditions (i.e., skewness coefficients being all above .50). In order to satisfy repeated-measures analyses of variance (ANOVA) normality assumptions, a square root transformation was applied to each within-subjects condition. Repeated-measures ANOVA were then conducted with two time-levels (before and after the PA sessions) and two PA activities (fitness and stretching) as within-subject factors for momentary positive and negative affective states. To fine-grain the analyses, repeated-measures ANOVA with two arousal levels (high- and low-activated affective states), two time levels (before and after the PA sessions), and two PA activities (fitness and stretching) as within-subject factors were finally run. In cases of significant effects, Bonferroni post-hoc analyses were used to highlight significant differences across time and groups.

3. Results

3.1. The PA programme's effects on general affective well-being

Table 1 presents the studied variables' means and standard deviations, while Table 2 presents the fixed effects parameters and random components for each subscale, for per-protocol analyses.

** Insert Table 1 here **

Per-protocol analyses did not reveal significant main effects of time nor group on the frequency of positive feelings, but revealed a significant time \times group effect ($B = 1.49$, 95% CI [0.63, 2.35], $\exp(b) = 4.44$). According to the odd ratio, the odds for positive feelings to improve across time were four times higher in the experimental group. Post-hoc analyses showed a between-group difference at T1 with the experimental group having less positive feelings than the comparison group ($M_{T1_comparison\ group} - M_{T1_experimental\ group} = 1.42$). Post-hoc analyses also revealed that the comparison group significantly decreased the frequency of its positive feelings between T1 and T2 ($M_{T2-T1_comparison\ group} = -.75$), while the experimental group increased it ($M_{T2-T1_experimental\ group} = .74$).

Results also revealed that time exerted a significant effect on the frequency of negative feelings, with a significant decrease in negative feelings across time ($B = -1.00$, 95% CI [-1.55, -0.48], $\exp(b) = .37$). The time \times group interaction was significant ($B = -1.62$, 95% CI [-2.64, -0.60], $\exp(b) = .20$), with a significant decrease in negative feelings only for employees in the experimental group ($M_{T2-T1_experimental\ group} = -1.81$, $M_{T2-T1_comparison\ group} = -.19$). The main effect of group was not significant. According to the odd ratio, the odds for negative feelings to increase across time were five times lower for participants in the experimental group.

Finally, the results did not reveal significant main effects of time nor group on the affect balance score, but revealed a significant time \times group interaction effect ($B = 2.71$, 95% CI [0.81, 0.62], $R\text{-marginal} = .02$, $R\text{-conditional} = .66$). Post-hoc analyses showed that only the experimental group significantly increased its ratio of positive to negative feelings one month apart ($M_{T2-T1_experimental\ group} = 2.24$, $M_{T2-T1_comparison\ group} = -.48$).

** Insert Table 2 here **

In comparison with per-protocol analyses, intention-to-treat analyses also revealed a significant time \times group interaction for positive feelings with a smaller odd ratio ($B = 1.30$,

95% CI [0.51, 2.09], $\exp(b) = 3.68$); a significant time * group interaction for negative feelings with a larger odd ratio ($B = -2.37$, 95% CI [-3.48, -1.25], $\exp(b) = .09$); and a significant time * group interaction on the affect balance score with a rather similar effect size ($B = 3.18$, 95% CI [1.32, 5.05], R -marginal = .03, R -conditional = .61).

3.2. PA sessions' acute effects on momentary affective states

Table 3 presents the studied variables' means and standard deviations. All effects are detailed in Table 4.

** Insert Table 3 here **

3.2.1. PA sessions' acute effects on momentary positive affective states

The results revealed that time [$F(1, 53) = 128.20$, $p < .001$, $\eta^2_p = .71$], type of PA [$F(1, 53) = 19.29$, $p < .001$, $\eta^2_p = .27$], and time \times type of PA [$F(1, 53) = 20.47$, $p < .001$, $\eta^2_p = .28$] exerted significant effects on momentary positive affect. Interestingly, post-hoc analyses showed that while momentary positive affect was not significantly different before a fitness or a stretching session ($M_{\text{positive affect_pre-fitness session}} - M_{\text{positive affect_pre-stretching session}} = .14$), it was significantly different after the PA session, with a larger increase in positive affect after a fitness session than after a stretching session ($M_{\text{positive affect_post-fitness session}} - M_{\text{positive affect_pre-fitness session}} = 1.79$, $M_{\text{positive affect_post-stretching session}} - M_{\text{positive affect_pre-stretching session}} = 1.19$). When affect arousal level was factored into the analyses, the results confirmed that time, type of PA, and time \times type of PA (see Table 4 for details) exerted significant effects, but they also showed a significant arousal level \times time interaction [$F(1, 53) = 92.35$, $p < .001$, $\eta^2_p = .64$]. Post-hoc analyses revealed that LAPA was significantly higher after the PA sessions ($M_{\text{LAPA_post-PA session}} - M_{\text{LAPA_pre-PA session}} = 2.77$) while change in HAPA across time was not ($M_{\text{HAPA_post-PA session}} - M_{\text{HAPA_pre-PA session}} = .21$). The time \times arousal level \times type of PA interaction was not found to be significant.

3.2.2. PA sessions' acute effects on momentary negative affective states

The results revealed that time [$F(1, 53) = 113.83, p < .001, \eta^2_p = .68$] exerted a significant effect, with lower negative affect at the end of the PA sessions ($M_{\text{sqrt_negative affect_post session}} - M_{\text{sqrt_negative affect_pre session}} = .41$). Effects related to the type of PA [$F(1, 53) = .09, p > .05$] and time \times type of PA [$F(1, 53) = .65, p > .05$] were beyond the significance level. When affect arousal level was factored into the analyses, the results confirmed that time (see details in Table 4) exerted a significant effect, also revealing significant interaction effects exerted by time \times arousal [$F(1, 53) = 10.93, p < .01, \eta^2_p = .17$] and arousal level \times type of PA [$F(1, 53) = 6.26, p < .05, \eta^2_p = .10$]. The time \times arousal level \times type of PA interaction was not significant. Of particular interest, post-hoc analyses revealed that, while HAUA and LAUA were both significantly different before and after the PA session ($M_{\text{square root_HAUA_post-session}} - M_{\text{square root_HAUA_pre-session}} = .49, M_{\text{square root_LAUA_post-session}} - M_{\text{square root_LAUA_pre-session}} = .33$), HAUA tended to decrease more than LAUA after the PA sessions.

* Insert Table 4 here *

Discussion

This study's objectives were twofold. Firstly, the study investigated the extent to which a four-week PA programme enhanced employees' general affective well-being within a one-month timeframe. Secondly, the PA sessions' acute effects on momentary positive and negative affect were studied with attention to the time (i.e., pre- versus post-PA practice), the type of PA (i.e., fitness versus stretching), and affective arousal (i.e., high- versus low-activated).

The first hypothesis found support in the current results, which showed a significant interaction between group and time on positive and negative feelings, highlighting that only employees in the experimental group slightly improved the frequency of its positive feelings and slightly reduced the frequency of its negative feelings after one month. These results reaffirm the effectiveness of PA when interested in enhancing general affective well-being in

employees (Bretland & Thorsteinsson, 2015; Hartfiel et al., 2012). They also replicate and extend other studies' results, emphasizing that short interventions, such as PA programmes (Bretland & Thorsteinsson, 2015) or positive psychological interventions (Rahm et al., 2017) have significant effects on employees' general affective well-being from one month. As such, even brief PA programmes may constitute an interesting way to counterbalance the negative effects of work-related emotional demands by reducing job-related strain and increasing employees' personal affective resources. Avoiding quasi-experimental design whenever possible, future studies should manipulate PA sessions' frequency and duration over a prescribed number of weeks in order to optimize short interventions. Indeed, participants from the experimental group (whether included in per-protocol or in intention-to-treat analyses) improved significantly their general well-being across one month. Such result indicates a reliable effect of the intervention but also suggests that less compliant participants might have also benefitted from the intervention. In the light of de Vries et al.'s (2020) results highlighting that PA exposure modulates the effect of a PA intervention in positive affect over time, it appears worthy to further investigate the minimal threshold for notifying a significant association between PA practice and changes in general affective well-being. Follow-ups at one to three months would also be useful to investigate the maintenance of such beneficial effects in a longer-term perspective.

It was also hypothesized that PA sessions would significantly increase momentary positive affective states (HAPA and LAPA) and decrease momentary negative affective states (HAUA and LAUA). As expected, analyses confirmed that PA significantly increased HAPA and LAPA and also decreased HAUA and LAUA in such a way that participants from the experimental group felt significantly more joyful and satisfied after a PA session but also less angry and sad. These results are in line with previous studies investigating PA sessions' acute effects on momentary affective states (Feuerhahn et al., 2014; Liao et al., 2015; Ménard

et al., 2017). Regarding negative affect, our results contrast with Feuerhahn et al. (2014), showing that even when momentary HAUA and LAUA are low before a PA session, they significantly decrease after PA sessions. Interestingly, LAPA had a larger increase than HAPA from before to after the PA sessions, while HAUA decreased significantly more than LAUA after the PA session.

According to the close links between momentary and subsequent affective states (Pavani et al., 2015), these repeated affective post-PA session improvements might partially explain why the experimental group significantly increased the frequency of positive feelings and reduced the frequency of negative one month apart. In addition, while post-PA practice affective improvements might have had interesting professional outcomes for employees from the experimental group, these benefits were probably also extended to their organization. Indeed, results from a multi-study (Warr, Bindl, Parker, & Inceoglu, 2014) have shown that HAPA is positively linked with proactivity, extra-role contribution, strategic scanning, problem prevention, and proficiency, while LAPA is associated with proficient performance. These multi-study's results also positively linked LAUA with effort and social withdrawals. Finally, it can be argued that the PA sessions were appropriately designed and led.

The significant interaction between time (i.e., pre- versus post-session) and the type of PA practice revealed that fitness sessions generated a larger increase in positive affective states than relaxation sessions. Fitness sessions' specific effects seem to align with studies that have claimed that practice intensity (i.e., light versus moderate-to-vigorous) matters when considering work-related well-being indicators (Gerber et al., 2013, 2017; Jonsdottir et al., 2010). Regarding psychological adaptations, such effects could be explained through the necessity to focus one's attention on internal information during strenuous PA practice, thus

limiting the possibility of entertaining negative work-related thoughts (Feuerhahn et al., 2014) nor rumination (van Hooff, Benthem de Grave, & Geurts, 2019).

Since, the present study did not objectively control practice intensity, the use of objective monitors, such as heart rate monitors, to control for practice intensity would have been necessary to support this hypothesis. The entertaining content of some fitness exercises (i.e., playfully performed between-group challenges) might also explain why fitness sessions generated more joy and satisfaction than stretching sessions. Indeed, fun experiences are positively related to HAPA and LAPA (Reis, O'Keefe, & Lane, 2017). Therefore, not only practice intensity but also exercise content might contribute to positive momentary affective states. Future studies should test this hypothesis by manipulating PA session content. Overall, even though both fitness and stretching sessions significantly improved positive momentary affective states, one PA practice's greater effect constitutes an interesting phenomenon that future studies should investigate. Indeed, when viewed as a daily or monthly choice, selecting one PA practice from a large range of possibilities could have specific implications on both employees' affective well-being and organizational needs and goals.

Beyond these results, this study has general limitations.

Firstly, PA sessions were scheduled either at midday or at the end of the workday, according to companies' organizational and technical characteristics (e.g., the duration of lunch breaks, the presence or absence of a worksite shower). Therefore, even though PA sessions were proposed in the workplace setting and were restricted to employees, it cannot be strictly said that PA sessions occurred in the context of work. These elements highlight the need for a better control when scheduling PA sessions in the workplace.

Second, the lack of measures about the different mechanisms that could explain the process through which employees from the experimental group improved their general and momentary affective well-being appears as a limitation. As a process, recovery experiences

that enable the psychological and physiological systems activated due to job demands or other stressors to return to their pre-demand levels (Sonnentag & Geurts, 2009) via psychological detachment from work, relaxation, mastery, and control, should have been assessed. Indeed, psychological detachment have been found to partially mediate the relationship between PA practiced after work and positive affect in the following evening (Feuerhahn et al., 2014), and to be improved during high-intensity PA practice (van Hooff et al., 2019). Positive physical self-perceptions including the feeling of competence are also recognized as a partial mediator of the relationship between PA practiced after work and positive affect in the following evening (Feuerhahn et al., 2014). Even if a short PA programme of the two different practices might appear rather short to develop new skills in one month, experiencing challenging situations leading to different forms of achievement (e.g., number of repetition done), might have partially contributed to the enhancement of positive affect. The sense of belonging which also constitutes a mediator of the relationship between PA practiced after work and positive affect in the evening (Feueurhan et al., 2014) might have been investigated since the quantity and quality of social interactions (Sun, Harris, & Vazire, 2019) are positively linked with affective well-being. Third, only four momentary affective states were selected on the basis of reliable tools and theoretical models (Van Katwick et al., 2000; Warr et al., 2014; Yik et al., 2011). Nevertheless, due to the respective five degrees of negative and positive affect according to their arousal level, further research is encouraged to examine in more details the relationship between physical activity and momentary affective states.

Moreover, individuals' affective states and well-being are influenced by several work-related factors, such as workload and organizational constraints (Van Katwyk, Fox, Spector, & Kelloway, 2000). Although they were not of primary interest, controlling for their respective contributions could have helped clarify the PA programme's effects on affective

well-being. Finally, the use of a quasi-experimental design does not allow concluding to a causal relationship between the completion of the PA programme and changes in affective well-being across one month. As recently pointed out, the difficulty in randomly allocating participants in organizational settings is a limitation that should be overcome (Ginoux, Isoard-Gautheur, & Sarrazin, 2019).

Conclusion

This study is one of the first to examine the contextual and situational effects of a short PA programme on employees' general and acute affective well-being. The results highlight significant improvements in general affective well-being for employees involved in the PA programme. Moreover, PA sessions increased positive affective states and decreased negative affective states. Of particular interest, 1) fitness sessions had a greater effect than stretching sessions on momentary positive affective states, and 2) LAPA was significantly higher than HAPA after PA sessions. Further studies are needed to assess the potential effect of the nature of PA (e.g., individual vs. collective, indoor vs. outdoor practices) as well as the process (e.g., psychological detachment, dose-response) through which general well-being and momentary affective states fluctuate following PA practice.

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