

# USER EXPERIENCES WITH DYNAMIC OFFICE WORKSTATIONS



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for life

Sedentary work entails health risks. Besides increasing the leisure time physical activity, prevention efforts at the office workplace itself are needed. Dynamic workstations, at which (computer) tasks can be combined with physical activity, may reduce the risks. This project evaluates three dynamic workstations with regard to their potential health benefits, effects on work performance, usability, comfort and acceptance.

## HEALTH RISKS OF SEDENTARY WORK

Sedentary work, i.e. work that is characterized by long periods of uninterrupted sitting, is associated with premature death in general, type II diabetes and obesity. These health risks have a dose-response relationship with sitting time; more hours of sitting lead to higher risks. For instance, each 2 hours per day increase in sitting at work was associated with a 5% increase in risk of obesity and a 7% increase in risk of type II diabetes. Persons who reported to be 'sitting almost all of the time' had a 1.5 higher chance to die within 12 years after the start of a prospective study than persons who reported to be 'sitting almost none of the time'. The health risks are also independent of the amount of physical activity a person has when he or she is not sitting. This means that persons with sedentary jobs who are engaged in sports still have a higher health risk than persons with non-sedentary jobs, like construction workers, who are also engaged in sports.

## DYNAMIC WORKSTATIONS

Dynamic (or active) workstations are workstations where (computer) tasks can be combined with physical activity such as walking, stepping, cycling or an elliptical leg movement while sitting. Given the dose-response relationship between sedentary time and health risks, and in view of the long hours spent behind a computer every day, the potential health benefits of combining physical activity with computer work seem to be great. Moreover, dynamic workstations have the ability to tackle the problem of sedentary work at its source: the workplace.

# 'WORKING ON THE BICYCLE WORKSTATION IS RATED MOST "PLEASANT".'

## METHODS OF EVALUATION

Nineteen office workers who were not familiar with dynamic workstations evaluated three dynamic workstations: a treadmill (LifeSpan), a bicycle ergometer (Tunturi E60) and a recumbent elliptical trainer (LifeBalance Station from Rightangle), all combined with a height adjustable desk. They used each workstation during 10 minutes, at a self-selected intensity with the instruction to "Choose a movement intensity that is as high as possible, but still allows you to work well and feel comfortable". All participants were Dutch and employees of TNO: 9 of them were female, 10 male; 12 were researcher or consultant, 3 project manager, 2 business developer, 1 HR manager and 1 trainee; the average age was 41 years; the average body height 177 cm; the average body weight 76 kg; and the average Body Mass Index 24.1 kg/m<sup>2</sup>. Ten participants (of which 4 women) met the ACSM Guidelines on Physical Activity and Health: at least 30 minutes of moderate intensive physical activity on at least 5 days a week. The participants performed their usual work: reading and typing texts, answering e-mails, making a telephone call, talking to a colleague. They filled out a questionnaire with 25 items, scored their emotional response with the Emocards method and answered questions of the test leader in an in-depth interview. In the Emocards method, 16 different cards (8 female - 8 male) depict facial expressions of emotions, emotions that are a combination of the dimensions 'pleasantness' and 'arousal' (see legend).

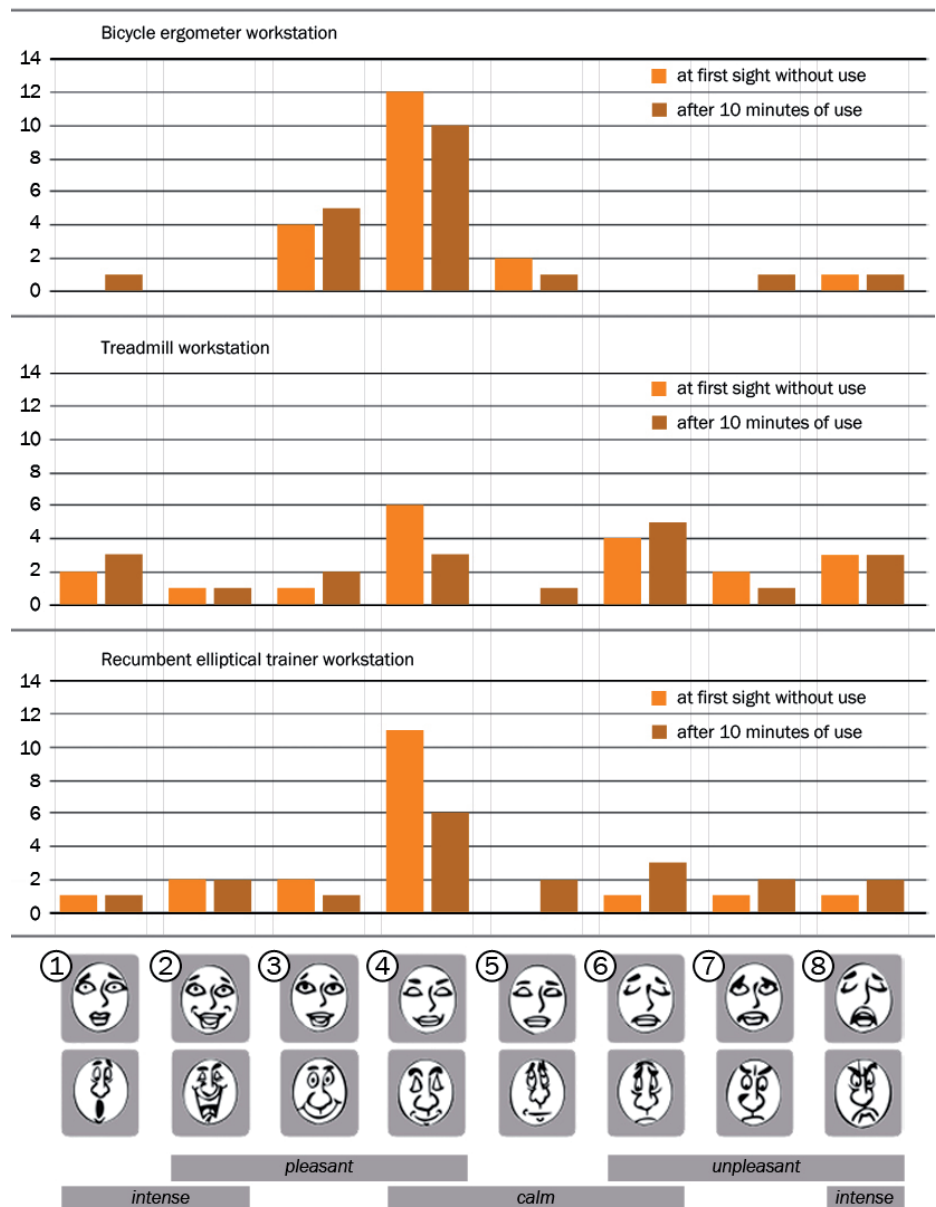
## EMOTIONAL RESPONSE

Without ever having seen a dynamic workstation, most participants (15) have a pleasant expectation of a dynamic workstation in general. They expect that "working and moving at the same time is fun" and are "curious to experience" such a workstation. The participants (3) that have an unpleasant expectation presume that "working and moving at the same time will be hard" and wonder whether "it is appropriate to do fitness at the office".

Then, after looking at the dynamic workstations for the first time (first impression), the participants' responses to the treadmill and the elliptical trainer are very diverse, ranging from 'intense

unpleasant' to 'intense pleasant', while their response to the bicycle ergometer is rather uniform and mainly 'calm pleasant'. They have significantly more 'pleasant' feelings about the bicycle workstation and

Emocard response to different workstations



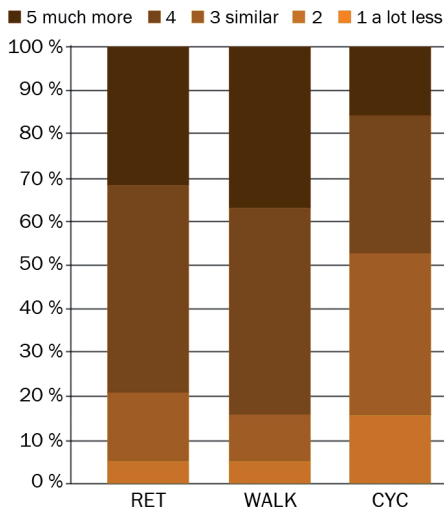
Emotional responses to the different workstations (see also legend on next page), at first sight without use (light bars) and after 10 minutes of use (dark bars). Number of participants with particular response is presented (n=19).

the elliptical trainer workstation compared to the treadmill workstation. After using each of the workstations for 10 minutes, participants still rate working on the bicycle ergometer significantly more 'pleasant' than working on the treadmill. However, they now rate working on the bicycle ergometer also significantly more 'pleasant' than working on the elliptical trainer. The participants' opinion about the bicycle ergometer has not changed between first impression without use and first experience after 10 minutes of use. The same is true for the treadmill; participants' expectations are not too high and these expectations are confirmed after the first experience. For the elliptical trainer however, the rather positive expectations have significantly changed towards 'unpleasant' after the first experience.

**PERCEIVED DISCOMFORT**

On each dynamic workstation, participants experience more discomfort than on a traditional workstation. When working on the treadmill workstation, the reasons for more perceived discomfort (4.2 average on a 5-point scale with '3' = 'similar discomfort') are: "my hands move too much" or "my head moves too much". When working on the elliptical trainer, the reasons for more perceived discomfort (4.0 average) are: "my knees hit the desk", "the elliptical movement is too heavy for my legs", "the desk is too high for my arms" or "the posture and movement of my legs feel uncomfortable". The reasons for more perceived discomfort (3.5 average) when working on the bicycle workstation are: "the seat is uncomfortable", "it feels instable" or "it is too strenuous for me". When comparing the three dynamic workstations, the perceived discomfort on the bicycle workstation is significantly less than on the treadmill workstation and on the elliptical trainer workstation.

**Experience of discomfort compared to a 'traditional workstation'**

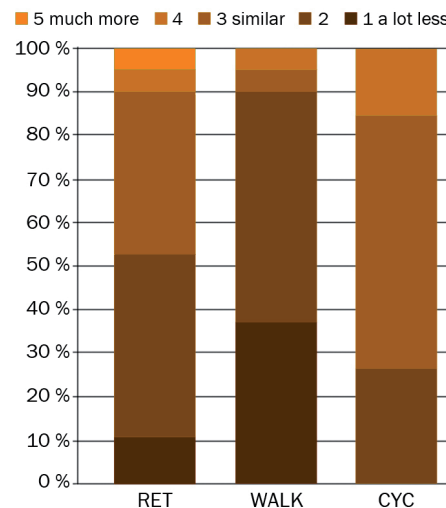


Perceived discomfort when working on a dynamic workstation (n=19).

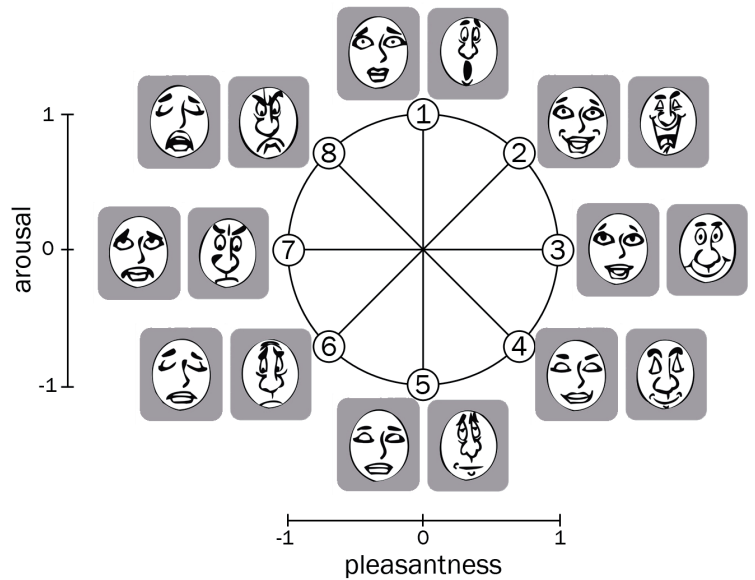
**EXPECTED WORK PERFORMANCE**

On both the treadmill workstation and the elliptical trainer workstation, participants expect that their work performance will deteriorate compared to a traditional workstation. The respective average scores on expected work performance are 1.8 and 2.5 (on a 5-point scale with '3' = 'similar performance'). However, participants do not expect a decline in work performance on the bicycle ergometer workstation: the average score is 2.9, and the expected performance is significantly higher on the bicycle workstation than on the other two workstations. The reasons for the expected lower work performance on the treadmill workstation are: "too much hand movement", "too much head movement" or "instability of whole body". The reasons for the expected lower work performance on the elliptical trainer are: "too much movement in body or legs", "hands too high above desk" or "stepping rhythm requires attention".

**Ability to execute daily work compared to a 'traditional workstation'**



Expected work performance when working on a dynamic workstation (n=19).



Emocards legend: arousal is displayed on the vertical axis (intense to calm), pleasantness is displayed on the horizontal axis (unpleasant to pleasant). Every emotional expression is displayed as a male as well as a female face, participants can choose either one.

**'THE WORK PERFORMANCE IS EXPECTED TO DECLINE ON TREADMILL AND ON THE ELLIPTICAL TRAINER'**

### INTENTION TO USE HIGHEST ON BICYCLE WORKSTATION

Thirteen of the 19 participants (68%) choose the bicycle workstation as their favourite dynamic workstation, whereas only 2 (11%) choose the treadmill and 3 (16%) the elliptical trainer. One participant (5%) has no favourite workstation at all. The intention to use a dynamic workstation during the actual work is significantly higher for the bicycle ergometer workstation than for the other two workstations (average score bicycle ergometer 3.4 on a 5-point scale with '1' = 'very low', '3' = 'neutral', '5' = 'very high' versus 2.4 treadmill and 2.1 elliptical trainer). Participants judge the bicycle ergometer workstation to be "the most pleasant" or "the least hindering" workstation and some "would like to give it a chance, although the seat is not comfortable".

### REASONS TO USE A DYNAMIC WORKSTATION

After testing each dynamic workstation, participants give a number of reasons why they would like to use one:

- It is a refreshing alternative to seated office work, gives a "boost of energy".
- It helps to prevent the lower back from becoming stiff and aching (which normally occurs after a long period of uninterrupted sitting).
- It increases the concentration, makes the mind more active.

### REASONS NOT TO USE A DYNAMIC WORKSTATION

However, participants also give several reasons why they would not use one of the evaluated dynamic workstations:

- The movement of the body hampers 'normal task performance' too much.
- No priority: work is busy right now and working and moving requires too much effort.
- Not spending enough time at the office, because of working at home and at customers' places.

### PRECONDITIONS FOR SUCCESSFUL USE OF DYNAMIC WORKSTATIONS

After this evaluation among 19 seated office workers, we see the following preconditions for successful use of dynamic workstations:

- The workstation should be easy to access, easy to use, easy to book and be within view of the traditional workstations (and not in a room far away).
- The workstation should provide adequate and stimulating feedback about the physical activity performance (preferably with a smart phone app).
- The evaluated dynamic workstations need ergonomic improvements: the bicycle ergometer should have a more comfortable seat; the recumbent elliptical trainer needs a better fit of the knee-desk distance; and the treadmill should be less noisy.
- The workstation should be located in a separate room, with air conditioning.

## CONCLUSIONS

The majority of a group of Dutch seated office workers is open to the new experience of working and moving at the same time on a dynamic workstation. Of the three dynamic workstations that were evaluated, the bicycle ergometer is judged as the one with: the most pleasant first experience after 10 minutes of working; the least discomfort; no decline in expected work performance; and the highest intention to use in a real life work setting. Working on the bicycle "is refreshing" and gives "a boost of energy". However, the seat of the bicycle is not comfortable enough and the actual use in daily life could benefit from adequate and stimulating feedback about the physical activity performance. As some office workers prefer using the treadmill workstation or the recumbent elliptical trainer, organisations could consider a test period with different dynamic workstations before deciding which one they buy.

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