To buzz or not to buzz: improving awareness of posture through vibrotactile feedback

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To Buzz or not to Buzz: Improving awareness of posture through vibrotactile feedback

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Abstract
The iPosture™ is a commercially available device which claims to improve posture. It is designed to deliver a vibrotactile buzz if the wearer slouches. We present the finding of a preliminary study evaluating the user experience of wearing it. Contrary to company claims, users found that it did not show them how to improve their posture but the buzzing did improve their body awareness.

Keywords
Wearable technology, posture, vibrotactile feedback

ACM Classification Keywords
H.5.2 Haptic I/O J.3 Health

General Terms
Posture, feedback, user study

Introduction
Having good body posture is central to most activities. However, many humans find it difficult to maintain this, resulting in back ache, neck ache and other problems. These are very prevalent symptoms; back pain, for example, results in about 40% of absences from work in the US and is estimated to cost between 50 and 100 billion dollars a year [1]. A range of technologies based

on forms of whole body interaction have been developed to improve posture. These include camera based approaches [6], mechanical switches [5], special jackets to record and monitor posture [2] and specially designed chairs with inbuilt sensors [7]. These research-based approaches have shown promising results, in terms of improvements in the user's posture.

Recently, off-the-shelf, affordable, lightweight systems have appeared. One in particular is the iPosture™ [3] device, which costs $79 and is geared towards the general public. However, the design is quite different to those mentioned so far. Simple, inexpensive, compact design has been favoured over measuring detailed information about body posture. It uses vibrotactile feedback to indicate to the wearer if they are slouching. The aim of our research reported here was to assess the user experience when people wear it as suggested. In particular we were interested in whether it was comfortable, effective and how people reacted and reflected on being buzzed by the vibrating device.

Background

A number of technologies have been developed to monitor posture and to give feedback in different modalities, making use of different means to motivate users. A camera based approach was developed by Sigurdsson and Austin [6] that used real-time visual feedback encouraging participants to visually monitor their own posture with popup reminders every 50 seconds. They found this produced improvements in posture. The "Wearable Therapist" [2] uses motion sensors attached to loose fitting clothes with the aim that long term recordings of a child's posture could be taken and used by a therapist to devise exercises that help improve their posture. So here the feedback is not given in real-time. They found that they could combine clothes that children liked to wear with a system that could measure posture to the accuracy required by therapists. In contrast, "Hey Buddy, take a break" [7] proposes a special chair with pressure sensors and cameras to monitor posture. Here the feedback will be delivered via a doll sitting on the user's desk, which becomes unwell in response to long periods of 'bad' posture, encouraging the user to take a break and nurse the doll. O'Brien and Azrin [5] experimented with vibrotactile feedback to discourage slouching. Feedback was set off by a switch across a patient's back that would break if they rounded their shoulders. This resulted in patients slouching significantly less whilst wearing the device. We are also researching the efficacy of vibrotactile feedback to aid learning the violin [4]. Initial studies suggest real-time playing related vibrotactile feedback is motivating and useful to players if they know how to interpret it.

The iPosture™ device

The iPosture™ claims to give the wearer "Perfect Posture!" [3]. Compared with the other posture correction technologies described, it has a number of advantages: unlike most of the designs it is light and portable; it is much less expensive than some of the setups [2, 4, 7]; and the feedback it gives does not interrupt the user's visual focus like a popup [6] and has a more direct effect than the doll [7]. It claims to be "your own personal coach" and promises many of the benefits which might be connected with good posture such as helping people trim their waistline, maximize their height, "gain confidence and energy" and "look younger and sexier".

The iPosture™ is a small circular device of approximately 1 inch in diameter and about a third of

an inch thick. It is designed to be worn "flat against the skin of the front upper chest" (see Fig. 1). Inside there is an accelerometer which is used to sense whether the wearer is slouching. It does this by measuring the angle of the upper chest. The user sets the iPosture™ by standing upright with 'good' posture and pressing the button in the centre of the device. This angle is taken to be the 'ideal' angle for the upper chest. If the wearer deviates from this angle (by the chest being tilted forwards) by more than 3° for more than one minute then the device will vibrate to indicate that the wearer is slouching. If the wearer does not straighten up after a minute the iPosture™ will vibrate twice. If the user still does not correct their posture the device will switch off for 15 minutes. We wanted to carry out an initial study to assess the user experience of wearing this device, to measure its effectiveness and whether it fulfils its claims.

Figure 1. The iPosture™ worn as directed by the manufacturer [3]

Assessing the User Experience

The iPosture™ was given to four people to informally experiment with. They chose to wear it for different lengths of time, from one day to one week. All wearers had jobs which required them to sit at desks or in meetings for long periods and all felt they suffered from some posture related discomfort as a consequence.

There were a number of similarities in user accounts. Firstly all users expressed doubt about whether the iPosture™ was correctly monitoring their posture and giving feedback at the right time; one said that "it seemed quite random." Three out of four of the users described situations in which the iPosture™ vibrated because they were leaning forward to talk rather than slouching. One user found that her office chair meant that she could lean back and slouch at the same time with no feedback but when she leant forward to type she received vibrations despite her straight posture. Users found this inaccuracy irritating.

Three out of the four users related incidents when the vibrations of the iPosture™ caused awkwardness in social situations. One user said she felt "uncomfortable" when it went off in a meeting because she was aware others might have heard it and think it was her tummy rumbling. Another said it made her "jump" during a meal with her family leading to "odd looks" until she explained about the device. A third wanted to lean forward to engage in conversation but the feedback forced her to lean back making her feel rude.

At least two of the users found the vibrations startling and also for one it was slightly uncomfortable. However another user said that she could not feel the vibrations clearly and often missed the first warning vibration.

Two users described occasions when they were unsure whether the device was switched on or not and one related an incident when it had fallen off and she had not noticed. This is a danger for a device with no on\off display and only interacts with the user intermittently.

The iPosture™ gives no indication of how the user should correct their posture. Most people seemed to pull their shoulders back and sit up straighter. This does not necessarily mean the wearer now has good posture. One of the users found that the new posture she adopted to avoid feedback caused pains in her chest. All users wanted the iPosture™ to give more information on how they could improve their posture. Despite this and its inaccurate way of measuring posture, all users agreed that the iPosture™ still succeeded in making them more aware of their posture and that this was probably useful for improving it.

Conclusions

Our initial study has shown how social interaction is important when designing a wearable well-being device which is to be worn for long periods of the day. The iPosture™ is not intended to play a role in social interaction; however it disturbs social situations both through its sound and its physical effect on users. It may be the conflict of visible effects coming from an invisible source which leads to some of the awkwardness in social contexts. Wearers are experiencing vibrotactile feedback in the everyday world where others are unaware of it – this contrasts with testing such feedback in a lab [e.g. 5] or investigating the use of vibrotactile feedback for short periods of time and where all parties know about its role, such as learning the violin [e.g. 4]. Hence this highlights the need for feedback to fit the social context as well as the intended purpose.

In sum, our study supports the concept that vibrotactile feedback can be used draw attention of the wearer to their physical behaviour and promote a desire to change that behaviour. Despite this, it appears such commercial posture devices are limited in improving well-being. The simplistic design of the iPosture™ means that it does not always give useful information, often misidentifying leaning forward as slouching which frustrated wearers. Nevertheless, users all agreed that although it did not always go off at the correct time, it made them more aware of their posture and this was helpful for them to improve it. Hence, it could be that a randomly vibrating device might be just as effective by simply reminding the user to correct their posture.

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