TACKLING AGEING CONTINENCE THROUGH THEORY TOOLS AND TECHNOLOGY (TACT3)- ASSISTIVE TECHNOLOGY DEVELOPMENT FOR CONTINENCE PAD USERS.

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INTRODUCTION

Continence problems are seldom mentioned but they are extremely common in the adult population and prevalence increases with age. Several studies have shown that urinary system function can decline with age[1,2,3] and concomitant diseases are more prevalent (congestive heart failure, Parkinson's Alzheimer's etc) also mobility problems are increasingly common in older people. Any limitation in mobility is likely to cause difficulties with continence simply because the person finds it difficult to reach the toilet in time or transfer onto it when they get there. Continence management difficulties have a huge impact both economically and in terms of quality of life for older people[4]. One of the main reasons that people move into residential care is an inability to cope with their continence needs[5]. The impact of continence difficulties is far more than just the physical effort and expense of continence management, the problem is strongly associated with reduced self-esteem, social isolation and depression[6].

THE TACT3 COLLABORATIVE RESEARCH PROGRAMME

The TACT3 Project is funded by the UK's New Dynamics of Ageing programme, a multidisciplinary research initiative with the ultimate aim of improving quality of life for older people. Five UK Research Councils have collaborated to produce the largest ageing research programme ever organized in the UK. TACT3 also has two Canadian linked projects funded by the Canadian Institutes of Health Research.

The overall aim of TACT3 is to reduce the impact of continence difficulties for older people. Three research work packages tackle different aspects of this challenge. Lead by the Helen Hamlyn centre at the Royal College of ART, our "Environmental barriers to continence" package is investigating the design and provision of toilets outside the home. Sheffield University and the Dalarna Research institute, Sweden are leading our "Continence interventions and services" package but the focus of this paper will be our "Assistive Technology development" package. We have a Canadian linked project with Cara Tannenbaum, University of Montreal, investigating some continence promotion interventions, developed in Canada for community groups in the UK. Our other Canadian Linked project with Jeff Jutai of the University of Ottawa, is developing an outcome measure for evaluating continence technology used by older people.

DEVELOPING ASSISITIVE TECHNOLOGY FOR CONTINENCE PAD USERS.

Treatments are available to alleviate incontinence but these treatments do not always give a complete cure. While waiting for treatment, waiting for treatment to become effective, or if treatment is not appropriate for some reason, urine loss needs to be contained to prevent hygienic or social problems. In these circumstances, continence pads are often chosen as a management option[7]. Substantial numbers of adults regularly use continence pads, evidenced by the global market for adult continence pads, which reached $4.4 billion in 2008[8]. Research on the effect of wearing continence pads, for women with urinary incontinence, has shown a number of "treatment effects" from pad use[9]. In this research, concerns about pad leakage and odor were the two most important fears and many women were living in a constant state of tension[9]. The inspiration for the devices described in this paper came from Cheryle Gartley, the founder and president of The

Simon Foundation for Continence, whose professional and personal experience had impressed on her the need for an early warning system for pad leaks and odors. Therefore, the TACT3 project set out to develop a color-change odor detector and early warning pad leakage detector.

METHODS

User-focused design

The design criteria for both the assistive technologies were determined by a series of focus groups. The focus groups were composed of continence pad users, carers and age related peers. Separate groups were held for the under wear development and the odor detector development. Participants were asked to discuss the potential usefulness of the products and the key design features. At the end of each session the participants were shown some potential embodiments of the products to allow them to select, comment on, and recommend changes.

Smart underwear

The underwear is designed to detect any leakage from the pad into the underwear and to alert the wearer before leakage can seep out into outer clothing and furnishings. This early warning relieves the wearer from the embarrassment and additional workload involved in a major pad leak.

The device is comprised of washable underwear with sewn in sensor and a detachable signaling unit that is attached to the underwear by press-studs and can be transferred to fresh pairs of underwear as required. The sensor comprises two parallel pathways of electro-conductive yarn, which run around the edge of the area where the pad is normally situated as shown in Figure 1.

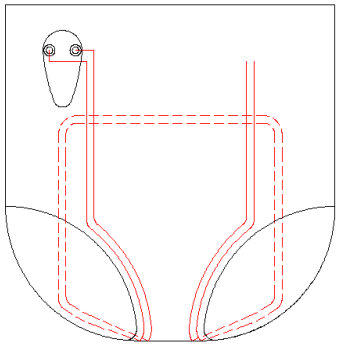

Figure 1 shows a diagram of the underwear with Electroconductive pathways in red.

The underwear can be worn with most types of disposable pads. The signaling unit (shown in figure 2) contains a microcontroller, a vibration unit, a coin cell battery and associated drivers, contained within a rounded low profile enclosure. The unit is normally in deep sleep mode, consuming minimal power. When urine wets the underwear and bridges the gap between the conductive pathways the unit is triggered to alert. Bridging the electro-conductive pathways act as a switch, triggering the software within the microcontroller to energize the vibration unit. Our original design included an option for a text message to be sent to the user's mobile phone, but our focus groups consistently preferred the vibration option, so this version has been developed for the clinical tests.

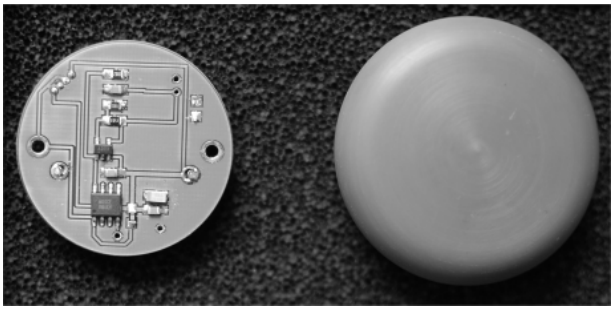

Figure 2 Signalling unit showing circuit board and enclosure

The smart underwear has been developed in collaboration with the University of Manchester

Color change odor detector

Research has found that fear of odor is a major concern for continence pad users, irrespective of the severity of their condition[9]. The color change odor detector is designed to respond to sub-olfactory levels of ammonia, the compound produced in stale urine. This allows the user to check for odor whenever they feel concerned and respond appropriately. The main benefit of this device is expected to be the reassurance that users obtain from the negative response of the device.

The device is based on a reversible dye reaction, which responds to ammonia levels as low as 2ppm. The prototype for the clinical evaluation is in the form of a key ring with both color change and reference components encapsulated within it. Focus group work has shown that users will require a wide variety of different embodiments to ensure that one single object does not become stigmatized.

The color change odor detector has been developed in collaboration with the University of the West of England

Clinical Evaluation

The Clinical evaluation of both prototype devices is being undertaken by the Biomed centre at Bristol Urological institute. Participants are being recruited through continence clinics and in the community. The International consultation on incontinence modular questionnaire- Lower Urinary Tract Symptoms Quality of Life (ICIQ-LUTSqol) is being used as a baseline measure before device use, and at the end of the test period. A specific evaluation questionnaire for the efficacy of the products both from a functional and quality of life point of view, developed from user requirement data gathered in the focus groups and functional parameters established in the development package, is being used as an outcome measure. In addition, the Psychosocial Impact of Assistive Devices Scale (PIADS), is being used to predict user satisfaction with the devices.

RESULTS

At the time of writing, some preliminary results have been obtained for the Smart underwear clinical evaluation pilot test with three women aged 47, 55 and 83 years. All the participants used the device in a variety of environments and reported feeling more confident when using the device. All found the alerting vibration discreet but easy to detect. One subject reported a problem with false positives. Over a total of 34 days testing, the participants recorded 77 pad leakage events 75% of which the women were not aware of before the Smart underwear alerted them to the leak. The leakage spread beyond the underwear on two separate occasions during the trial, once to the outer garment and once as far as the furniture.

The early results were very promising and we hope to report the full clinical results at this summer's conference.

ACKNOWLEDGEMENTS

With thanks to Professor Alan Walker, Director of the New dynamics of Ageing programme and the Economic and Social Research Council (ESRC) for their continued support for the project. Acknowledging the hard work of all our co-investigators: Dr Kevin McKee and Dr Lena Dahlberg, Dalarna Research Institute and Dalarna University, Sweden Prof Stuart Parker, The University of Sheffield, Prof Patrick Gaydecki, The University of Manchester UK, Prof Norman Ratcliffe, University of the West of England, Jo-Anne Bichard, Royal College of Art, UK, Adele Long, BioMed HTC, Bristol Urological Institute, UK. We would also like to thank our project partners; The Simon Foundation for Continence, Devices for Dignity, Technology Sourcing, The Gut Trust, The National Trust, AgeUK, Centre for Accessible Environments, Age Concern-Barnsley, and the British Toilet Association, for their continuing advice and support

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