Currently, ICS-defined verbal sensory thresholds are the only standardized, objective measures of real time bladder sensation in the micturition filling phase. A non-invasive protocol was previously developed using 3D ultrasound along with a sensation meter to better characterize real time bladder sensation and its correlation with bladder volume/shape/rhythm. This study validates the protocol by measuring the effects of participant training and ultrasound probe pressure on bladder sensation in our oral hydration protocol.

METHODS

Ten healthy volunteers (3 male, 7 female) with no urinary symptoms based on ICIq-OAB scores were recruited into an oral hydration study. The participants drank 2L Gatorade G2 and used a touch-screen meter (Fig. 1) throughout 2 visits every 5 minutes using the Ultrasound Bladder Scan. Average and SEM age and BMI of the participants were taken every 5 minutes using the Ultrasound BladderScan. Average and SEM age and BMI of the participants were 25.6 ± 2.03 years and 24.8 ± 1.6 kg/m² respectively.

The study was repeated 3 times, once a week (visits A, B, and C). In visits A and B, ultrasound images were obtained every 5 min. The ultrasound was not used in visit C. Bladder volume measurements were taken every 5 minutes using the BladderScan. Average and SEM age, and BMI of the participants were 25.6 ± 2.03 years and 24.8 ± 1.6 kg/m² respectively.

Our results have shown two aspects of improvement for a new non-invasive approach to allow patients who suffer from overactive bladder to feel more comfortable during the evaluation of their condition using oral hydration studies. Studying repeatability between visits and fills will make the use of this type of study more feasible.

Because both visits A and B had ultrasound, the decreased sensation (left shift) at low bladder capacities from A1 to B1 likely represents the effects of training (Fig. 6, red arrow). Training may increase the participants’ awareness of their own bladder sensation, and thus increase their sensation threshold in regards to bladder capacity after going through a fill-void cycle for the first time. Looking at fully trained participants, there was a further decrease in sensation (left shift) comparing B1 to C1 where the ultrasound probe was withheld (Fig. 6, blue arrow). This indicates that the ultrasound probe may cause increased bladder sensation due to the pressure applied on the participant’s bladder. Fill 2 of each visit had no significant differences between visits, showing one promising aspect of repeatability.

This validation study demonstrates that during oral hydration studies with two fills, training and ultrasound probe pressure can affect real-time bladder sensation, but this was not significant in the faster second fill. This will further clarify variables that influence non-invasive metrics for filling phase sensation.

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