A Preliminary Study on Estimation of Urination Desire Level from Vital Signs

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Abstract— Urination prediction is critical for elderly care, and it has been shown that urinary volume influences significantly vital signs. However, no studies have reported the relationship between different urination desire levels and vital signs, nor the predictability of urination desire level by vital signs and HRV (Heart Rate Variability). This paper presents the preliminary results that fills up the gap above.

Clinical Relevance— The paper shows that the vital signs (ECGs, blood pressure, and heart rate) and HRV are highly correlated with urination desire levels. This shows the possibility to use vital signs to conduct urination prediction, which is contactless and suits the needs of dementia people.

I. INTRODUCTION

Urination prediction is critical for elderly care. Emura et al. compared the autonomic nervous system during urinating on the bed and in the restroom [1]. Matsumoto et al. showed the changes of blood pressure and heart rate before and after urination [2]. However, no studies have reported the relationship between different urination desire levels and vital signs, nor the predictability of urination desire level by vital signs and HRV (Heart Rate Variability).

In this study, we explored the possibility to predict the self-reported urination desire levels from vitals and HRV.

II. METHODS

In the experiment with 12 healthy subjects, electrocardiogram (ECG) and blood pressure were measured while the urination desire was reported and recorded. The urination desire level was set as Table I regarding the study by Kumori et al. [3]. From the ECG, RR interval was obtained by using time domain analysis. ECG measurement, processing and analysis.

Sensitivity, specificity, accuracy, F value were used to classify urination desire levels from heart rate, blood pressure and some indexes of HRV (SVM) was used to classify urination desire levels from heart rate, blood pressure and some indexes of HRV. The experiment results suggested that vital signs and HRV may contribute to the estimation of the urination desire levels. Data from more subjects should be collected.

REFERENCES

III. RESULTS

A significant difference was found in the comparison of urinary volume influences significantly vital signs. However, no studies have reported the relationship between different urination desire levels and vital signs, nor the predictability of urination desire level by vital signs and HRV (Heart Rate Variability). Table II shows that there was a significant difference in the comparison of systolic blood pressure in Level 4 and Level 5. The significant difference was found in the comparison of diastolic and systolic blood pressure in Level 4 and Level 5. The significant difference was found in the comparison of diastolic and systolic blood pressure in Level 3 and Level 4. There was no significant difference in the comparison of diastolic and systolic blood pressure in Level 3 and Level 4. There was no significant difference in the comparison of diastolic and systolic blood pressure in Level 3 and Level 4. There was no significant difference in the comparison of diastolic and systolic blood pressure in Level 3 and Level 4. There was no significant difference in the comparison of diastolic and systolic blood pressure in Level 3 and Level 4.

IV. DISCUSSION & CONCLUSION

The experiment results suggested that vital signs and HRV may contribute to the estimation of the urination desire levels. Data from more subjects should be collected.

In the future, unrestrained vital sign measurements for elderly people with dementia will be further explored.