DISCUSSION

From the kinematic analysis, it is clear that one type of wrist does not fully define the workspace. The data shows that the PFW is beneficial for tasks requiring access to the midline of the body, such as eating and dressing, or picking things off the floor or table (Figures 3). Other tasks, such as unscrewing a bottle or turning a key, are more easily accomplished using a wrist rotator. An ideal solution would be to have both a rotator and a PFW, since the workspace is greater. However, length, weight, battery life, and the need to control so many degrees of freedom must be taken into consideration for different individuals.

Figure 3: Individual executing tasks using the Powered Flexion Wrist.

If only one wrist function can be integrated into a prosthetic system, the prosthetist should recommend the wrist which best matches the desired functional outcomes of the individual.

Although the weight of the PFW is heavier than the wrist rotator alone, it is interesting that the field trial participants did not rate the wrist as being too heavy. One respondent made the point that if the device is functional, the weight is secondary.

The first set of feedback motivated a design change in the transmission, which increased both the passive positionability and the active torque of the system. The second set of feedback indicates that the current design is acceptable.

CONCLUSION

The kinematic analysis and the results from user questionnaires clearly show that a Powered Flexion Wrist offers potentially significant functional benefits for individuals with upper-limb loss. When choosing an appropriate wrist, one must consider the types of tasks desired to be performed and the person's functional workspace.

DISCLOSURE

Fillauer manufactures externally powered and passive flexion and rotation devices.

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