

Dear Valued Practitioner,

This guide provides a series of recommendations to facilitate the reimbursement process. Please note that PSYONIC does not guarantee reimbursement in any form and shall not be held liable for audits, issues, or adjustments to its customers’ claims or funding vehicles for any component(s) of the Ability Hand System. Please contact PSYONIC if you have any additional questions.

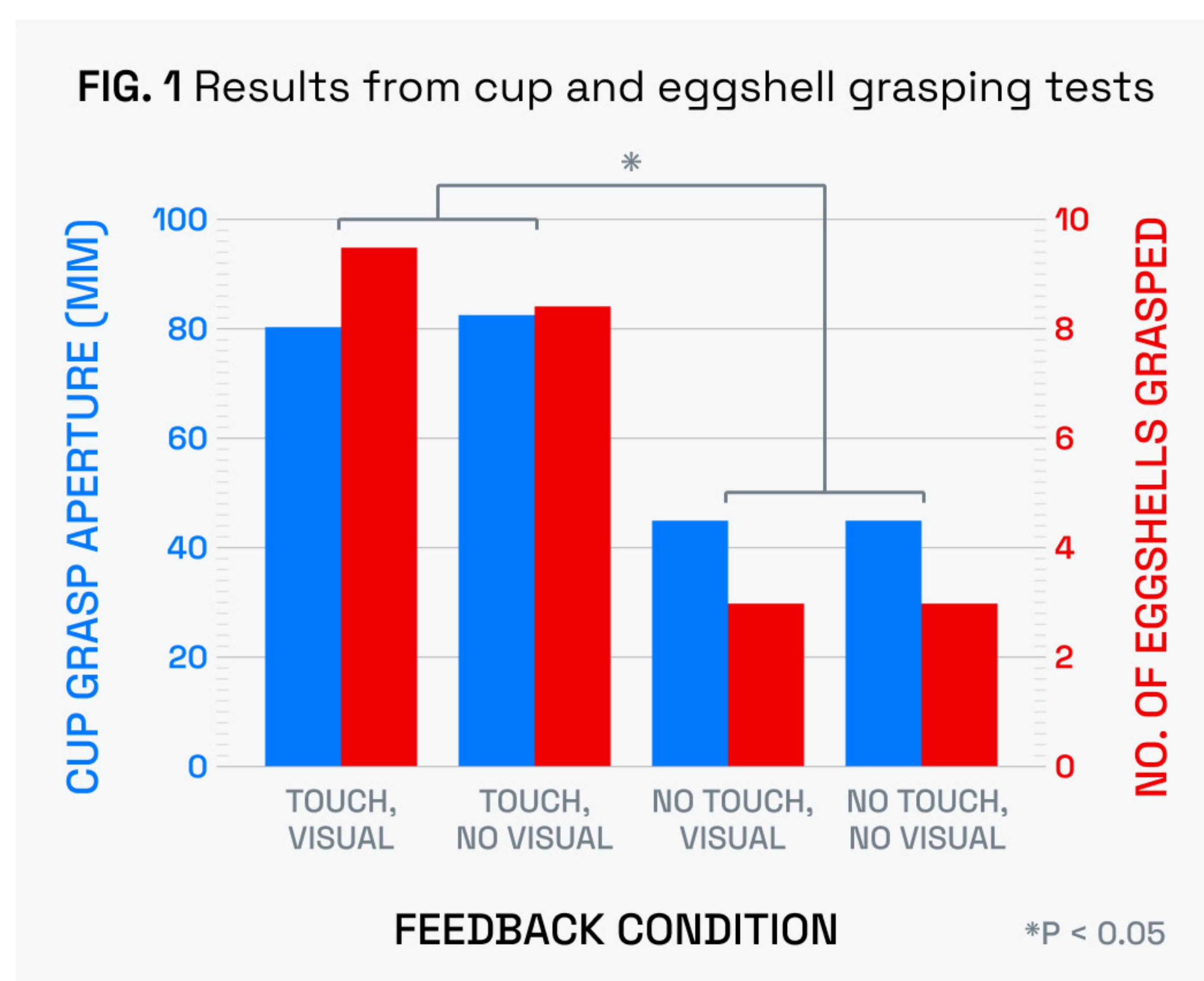
PSYONIC recommends using the following HCPCS codes for appropriate billing of the Ability Hand:

L6880	Myoelectric Hand with Articulating Digits L6880 covers an electric hand with independently moving fingers, controlled by switches or myoelectric signals, and capable of multiple grasp patterns. The Ability Hand supports various control systems and features six individual motors for natural, flexible movement. Myoelectric, multiarticulating hands like this have been the standard for over a decade [2-3], improving both fine and gross motor function by adapting to a wide range of object shapes.
L6881 or L6882	Automatic Grasp or Microprocessor Control Feature L6881 and L6882 are both add-on codes for upper limb prosthetic devices, but only one can be billed per hand. L6881 covers an automatic grasp feature [4], like the Ability Hand’s slip detection, which uses pressure sensors in the thumb and index finger to gently reclose the hand when an object starts to slip—mimicking natural reflexes. L6882 refers to microprocessor control [5], which the Ability Hand also includes. Its onboard microprocessor allows for highly refined movement, user-specific adjustments, and unlimited grasp patterns, all programmable via a mobile app.
L6629	Electronic Quick Disconnect L6629 applies to a quick disconnect lamination collar with coupling, such as Ottobock’s or similar [6]. The Ability Hand includes an electronic quick disconnect (EQD), allowing for wrist rotation that mimics natural movement and improves function.
Additional Features	
L7499	Multifinger Sensorization with Vibration L7499 is a miscellaneous code used for features not otherwise classified. For the Ability Hand, it covers the touch feedback system, which uses finger pressure sensors and a vibration motor to simulate a sense of touch. This feedback helps users feel when they make or release contact, improving control when handling objects of different sizes and densities.

Multifinger Sensorization Supporting Research

Poor manipulability due to the lack of sensory feedback is a leading cause of prosthesis abandonment [7-8]. While body-powered prostheses can give users some sensory feedback, these devices are limited in achievable grasps and can cause overuse injury in the shoulders of the user. The PSYONIC Ability Hand is the first commercially available multiarticulated myoelectric prosthetic hand to provide users with touch feedback from multiple digits - namely, the thumb pad, as well as the tips, pads, and lateral aspects of the remaining individual fingers.

There are several functional advantages to providing sensory feedback in a multiarticulated prosthesis, including contact detection and body self-identification [9]. An external study by Matulevich, et al. [10] showed that users could grasp foam, crackers, and hollowed eggs statistically significantly faster (between 1.4x-3.3x) when using contact detection from pressure sensors on a prosthetic hand. Another external study by Berke, et al. [11] showed users performing tasks more than 15 seconds faster on average when provided with contact detection.



Internal studies conducted by PSYONIC have shown statistically significant performance improvements when grasping a plastic cup and hollowed eggs (eggshells). Prosthetic hand users were given four feedback conditions in which both touch feedback and a blindfold were either on or off. Preliminary results were published in Akhtar, et al. [12], followed by additional internal experiments whose results are shown in Fig. 1. Users were able to grasp the cup without crushing it when given touch feedback, having a statistically significantly greater grasp aperture even when blindfolded. They were also able to successfully grasp statistically significantly more eggshells without cracking them when given touch feedback, again even when blindfolded.

Incorporating contact detection with vibration feedback in a socket has also shown to statistically significantly improve prosthesis performance when performing both virtual and real activities of daily living [13]. Additionally, all users in the study reported the touch feedback was especially useful when visual feedback was poor (e.g. grasping a hidden object or at night) or when grasping fragile objects.

Finally, Marasco, et al. [9] provides physiological and psychophysical evidence that touch feedback from a prosthesis helps users incorporate the prosthesis into their self-image. This is critical in developing a user's confidence in performing activities of daily living that might prove to be more difficult or time-consuming without the use of a sensorized multiarticulated prosthetic hand.

References

1. HCPCS. Nov 2019. <https://hcpcs.codes/l-codes/L6880>
2. K. Ohnishi, et al., "Neural machine interfaces for controlling multifunctional powered upper-limb prostheses," *Expert Rev Med Devic.* 4(1), 43-53, 2007.
3. S. Engdahl, et al., "Surveying the interest of individuals with upper limb loss in novel prosthetic control techniques," *J Neuroeng Rehabil.* 12(53), 2015.
4. HCPCS. Nov 2019. <https://hcpcs.codes/l-codes/L6881>
5. HCPCS. Nov 2019. <https://hcpcs.codes/l-codes/L6882>
6. HCPCS. Nov 2019. <https://hcpcs.codes/l-codes/L6629>
7. D. Atkins, et al., "Epidemiologic overview of individuals with upper-limb loss and their reported research priorities," *J Prosthet Orthot.* 1996.
8. B. Peerdeman, et al., "Myoelectric forearm prostheses: State of the art from a user-centered perspective," *J Rehabil Res Dev.* 48(6), 719-737, 2011.
9. P. Marasco, et al., "Robotic touch shifts perception of embodiment to a prosthesis in targeted reinnervation amputees," *Brain*, 134(3), 747-758, 2011.
10. B. Matulevich, et al., "Utility of contact detection reflexes in prosthetic hand control," *IEEE IROS*, 2013.
11. G.M. Berke, et al., "Contact reflex improves fragile grasping while blindfolded," *AAOP Annual Meeting & Scientific Symposium*, 2017.
12. Akhtar, et al., "A low-cost, open-source, compliant hand for enabling sensorimotor control for people with transradial amputations," *IEEE EMBC*, Aug 2016.
13. F. Clemente, et al., "Non-invasive, temporally discrete feedback of object contact and release improves grasp control of closed-loop myoelectric transradial prostheses," *IEEE TNSRE*, 24(12), 1314-1322, 2016.