

A. LUO. *The effects of ergonomic redesigns of an Eastern percussion instrument on elderly performers. Gerontechnology 2010;9(2):305; doi:10.4017/gt.2010.09.02.209.00.* **Purpose** Playing a musical instrument requires complex sensorimotor programming of hand and finger movements. During musical training, these motor programs are optimized to achieve the highest accuracy with minimal effort. Aging may also dramatically affect the central and peripheral nervous systems, which may, subsequently, severely compromise player performance, especially for those who rely heavily on maintaining the highest level of sensory perception and neuromuscular control¹. If an elderly performer uses an instrument with a design not suited to their hands, they could injure their hands which could decrease playing efficiency and satisfaction, and result in postural discomfort, including unnatural postures, excessive muscular force, and high rates of manual repetition². A musical instrument should fit a performer as much as possible³. The yinqing is a musical instrument commonly played during worship in Buddhist or Taoist services in Asia. Holding the yinqing is a complex gesture. The handle of the yinqing is held by the left hand and the metal wand is grasped by the thumb, index and middle fingers—the index finger controls the metal wand to generate a clear sound while beating a copper bowl. According to pilot study results, playing a yinqing leads to unnatural postures, resulting in postural discomfort. Improving the 'fit' between a performer and the yinqing is a significant concern. Unnatural postures and postural discomfort are risk factors for upper extremity injuries³. Such problems can be alleviated by redesigning the yinqing. **Methods** The methods of observation, design, and evaluation with the electromyography are used. Three yinqing are used for the experiment (one original and two redesigned yinqings). The redesigned yinqing (No. 1) consists of a copper bowl with a curved handle with 19 and a free-form hook. The free form hook leans lightly against the jaw's mouth between the thumb and index fingers; the curve wand is manipulated by the four fingers of index, middle, ring and pinky. The redesigned yinqing (No. 2) is cylindrical, causing the fingers to wrap firmly around the object and overlap the thumb. The large contact area should leave no concentrations of local high pressure to prevent grip strength from being hindered by discomfort. **Results & Discussion** Twelve elderly female yinqing performers participated in this experiment. Analytical results indicate that playing a regular yinqing leads to unnatural hand postures, repetitive finger action, and tissue compression stress on a small area of the palm where there is reduced sensitivity in elderly performers. Significant evidence of EMG activities exists for the original and two redesigned yinqings (*Figure 1*). The thick portion of the two redesigned yinqing handles provide large area for contact with the palm, subsequently increasing the firmness of the hold when grasping the yinqing, and resulting in a natural posture that keep the hand and forearm aligned⁴. This study ergonomically redesigned the yinqing, an instrument commonly used in worship, to reduce the stresses generated when the yinqing is played by the elderly.

References

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Figure 1 Three yinqings used in the experiment