**CREATION OF A NOVEL 3D PRINTED OPTOKINETIC DRUM (OKD) WITH SMARTPHONE VIDEOGRAPHY**

Lemanski BCP1, Lemanski N1, and Cheng M1

1. Mabel MP Cheng MD PLLC, 3140 Troy Schenectady Road, Niskayuna, NY 12309

**Background:** OKDs are utilized in neuro-ophthalmology for eliciting optokinetic reflexes (OKRs). OKR develops at 6 months of age and is useful for determining basic central nervous system functionality, visual pathway response, and stereopsis development in strabismus management. OKDs are useful diagnostic adjuncts when MRI or CT are not available. Unfortunately, OKDs are too expensive to be left on medical missions, and no commercial OKD exists for video recording, the latter useful for teaching use of OKD, remote interpretation of OKR, or self-use of OKD. A 3D printed approach was sought to achieve all objectives with videography by any smartphone.

**Methods:** A cylinder with two interlacing halves (creating an alternating pattern when printed in different colored filament) connects to a two-piece crank through a stationary handle by a tie rod via cantilevered snap fit. A universal smartphone attachment connects to the stationary handle by 3 knurled nuts for video recording. Designs sliced in Cura 3.6.20 were printed on a Single Extruder (2.1) LulzBot TAZ 6 (PLA+ at 380 μm). Fatigue testing was performed by cranking the assembly for 10 minutes. Smartphone clasp was tested in horizontal and vertical positions.

**Results:** Print statistics: 29 hours; 70.55 filament meters; filament cost: 15.10 USD. Horizontal and vertical OKR was elicited in authors with smartphone videography capture of binocular responses in both orientations. Videography quality was suitable to observe OKR on playback. Crank handle allowed single observer capture of OKR; 1000 rotations observed no part wear.

**Conclusions:** The 3D printed OKD is a reliable and inexpensive alternative to commercially available OKDs. To the best of our knowledge, the OKD proper is the first fully 3D printed OKD, possibly the first fully 3D printed ophthalmic diagnostic device, and the first OKD to have smartphone videography capabilities.

**Content Category:** Basic Science

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