Struggling for breath: Videogame technology documents abnormal breathing patterns

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Patients with a common chest deformity known as sunken chest exhibit dysfunctional chest wall motion, a finding that may explain routine reports of exercise intolerance pectus patients, according to a study presented at the American Academy of Pediatrics (AAP) in San Francisco.

Researchers at Virginia's Children's Hospital of The King's Daughters (CHKD) and Eastern Virginia Medical School (EVMS) used optoelectronic plethysmography to analyze chest wall movement in patients with normal chests and patients who suffer from the chest wall deformity formally known as pectus excavatum.

The patients with pectus excavatum had less chest wall motion around the deformity and appeared to compensate by drawing in more air with their abdominal muscles.

"We believe these findings may explain the complaints of shortness of breath and easy fatigability of patients with non-corrected pectus excavatum," said CHKD pediatric surgeon Robert Obermeyer, MD, an assistant professor at EVMS. "Essentially, these patients are working harder to get the same amount of breath."

Pectus excavatum results from abnormal growth of the cartilage at the breastbone, causing an indentation. Often described as sunken or funnel chest, pectus excavatum, occurs in one in every 1,000 children and can range from mild to severe.

In the past, pectus excavatum was described as cosmetic, but pectus patients routinely complain about difficulty breathing, especially during exercise.

While static airflow measures have failed to document significantly decreased air flow, the study presented at the APP demonstrates that pectus patients must use different muscles to achieve the same level of air flow.

Based on video game technology, optoelectronic plethysmography helps create realistic animated figures by using reflective markers on actors to capture the movement of arms, legs, hands and details as fine as the movement of facial features.

For the pectus study, 89 reflective markers were placed on 119 research subjects, including 64 with pectus excavatum.

Chest wall movement was recorded by eight infrared cameras as the subjects breathed. Pattern-recognition software computed the three-dimensional coordinates of each reflective marker, capturing the movement of the chest wall.

In patients with pectus excavatum, the movement of the chest wall near the deformity decreased as the abdominal efforts increased.

"This is likely to be an attempt to compensate for the dysfunction of the upper chest wall motion," said Dr. Obermeyer.

Future research will use optoelectronic plethysmography to determine if the chest wall movement normalizes after correction of the defect.

Provided by Eastern Virginia Medical School