Biomedical/Educational Update:

Virtual reality tested as teaching tool

"Virtual reality" is a technology worth exploring as an educational tool for autistic children, according to a new study by Dorothy Strickland et al.

Virtual reality (VR) uses computers to place the user "inside" a three-dimensional scene which changes in accordance with the user's actions. In "immersion" VR, the type used by Strickland and colleagues, the user wears a helmet containing two video screens, one suspended in front of each eye. As the user moves, the VR environment changes in a realistic manner.

The researchers theorized that VR might be helpful in training autistic children because VR is visually oriented. "Many have observed that thinking in people with autism is primarily visual," they note. In addition, they say, VR "isolates specific stimuli from the environment and allows subjects to control how much they will experience." Because of its realism, the researchers add, the technique also may be useful in teaching autistic children to generalize skills to new settings.

Strickland et al. briefly introduced two autistic children, ages 7 and 9, to a VR program designed to teach the children how to cross a street. The researchers say the children accepted wearing the VR helmet "and immersed themselves in the virtual scenes to a degree that they verbally labeled objects and colors of objects." They add that "both children consistently tracked moving objects in a scene, with both eyes, head, and body turning." One child was able to turn, locate a stop sign in a scene, and walk to it, while the other (who had more difficulty understanding the three-dimensional aspect of VR) was able to identify the stop sign but not to consistently walk toward it.

In addition, both autistic children attempted to use the interactive hand controls on the VR unit; however, the researchers say, the controls were difficult for the children to manipulate.

The researchers conclude, "our results indicate that the children will accept a VR helmet and wear it, identify familiar objects and qualities of these objects in their environment while using the helmet, and locate and move toward objects in their environment while wearing the helmet." These encouraging preliminary results, they say, suggest that VR may have potential both as a teaching tool and as a means of furthering researchers' understanding of the perceptual problems of autistic individuals.

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"Brief report: two case studies using virtual reality as a learning tool for autistic children," Dorothy Strickland, Lee M. Marcus, Gary B. Mesibov, and Kerry Hogan; *Journal of Autism and Developmental Disorders*, Vol. 26, No. 6, December 1996, pp. 651-659. Address: Dorothy Strickland, c/o TEACCH, CB #7180, 31 O Medical School Wing E, University of North Carolina at Chapel Hill, Chapel Hill, NC 27599-7180.

REMINDER:

A subscription to the ARRI is an excellent gift for a friend, relative, or teacher interested in autism!

Fenfluramine neurotoxicity: new data

Many scientists opposed the FDA's approval of the weight loss drug fenfluramine, sometimes used to treat autistic children's behavioral problems, because of evidence that the drug is neurotoxic in animals. A new study, conducted at Johns Hopkins, offers more evidence supporting fenfluramine critics' concerns.

George Ricaurte et al. used positron emission tomography (PET) scans to study the effects of fenfluramine on the brains of baboons. The researchers used a radioactive marker that binds to a protein on neurons that respond to the neurotransmitter serotonin. "After four days of treatment with about twice the dose of fenfluramine needed to cause weight loss," Kurt Kleiner reported in *New Scientist*, "the PET scans showed that the baboons' brains held on to much less of the marker, suggesting that there had been damage to the serotonin cells."

Although some researchers have argued that cell damage seen in the brains of animals exposed to fenfluramine is temporary, Ricaurte conducted follow-up PET scans that revealed that the damage to the baboons' brains was not reversed over a three-month period. "Dissections of the animals' brains," Kleiner notes, "confirmed that serotonin cells had been damaged."

Earlier, researchers reported that fenfluramine is linked to a serious and often fatal lung disorder called pulmonary hypertension (see ARRI 10/3). Lucien Abenhaim and colleagues reported that people taking fenfluramine-derived drugs for more than three months "had 30 times the risk of the ailment than those who had never taken the drugs."

Fenfluramine became a popular autism treatment in the 1980s, when initial studies suggested that it could increase IQ and reduce behavior problems in autistic children. Numerous studies since that time indicate that fenfluramine is of little use in the treatment of autism, although some physicians still prescribe the drug.

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"Concerns grow over weight loss drug," Kurt Kleiner, *New Scientist*, Dec. 14, 1996.

More on ketogenic diet

ARRI recently reported an upsurge in interest in a seizure treatment known as the "ketogenic diet" (see ARRI 10/1). A new study indicates that a variation of this diet benefits many individuals whose seizures are poorly controlled by medications.

The ketogenic diet, first used successfully by the Mayo Clinic in the 1920s, is based on the observation that fasting can reduce the frequency of seizures. Like fasting, the ketogenic diet causes the brain to burn ketone bodies (byproducts of fat metabolism) instead of sugar for energy, a condition known as "ketosis." For reasons that are poorly understood, ketosis has an anticonvulsive effect.

Unfortunately, some patients are unable to tolerate one form of the ketogenic diet—the medium-chain triglyceride (MCT) diet—because it causes gastrointestinal problems. Dietitians Sari Edelstein and Martha Chisholm studied a different form of the diet, the non-MCT high-fat diet, to see if it would be well tolerated and equally effective.

Edelstein and Chisholm tested the non-MCT high-fat diet on 20 pediatric patients between the ages of 15 months and 11 years. All of the subjects had a history of epileptic seizures that were poorly controlled by medications. Patients were hospitalized for several days while the diet was initiated.

The researchers report that during the two weeks after discharge, the non-MCT high-fat diet reduced seizure frequency in 16 of the 20 patients. While some patients experienced hypoglycemia, constipation, diarrhea, and vomiting, no patients found it necessary to discontinue the diet because of side effects. Three patients were able to stop taking all anticonvulsant drugs, and nine others were able to reduce their medications. The researchers say that parents of several of these children reported that "discontinuation of seizure medication resulted in a 'more awake' or 'a different' child."

Edelstein and Chisholm also report that "incorporating foods children preferred, even in limited amounts, resulted in improved acceptance of the diet" without seriously compromising its effects—an important finding, since many children have difficulty adhering to the ketogenic diet without "cheating." Ketosis was maintained despite minor dietary variations, the researchers say, "because of the high fat level of the diet."

Edelstein and Chisholm note that patients for whom the ketogenic diet is effective need to maintain the regimen for two years. "After this period," they note, "seizure activity is less likely to recur, even when a regular diet is resumed."

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"Management of intractable childhood seizures using the non-MCT oil ketogenic diet in 20 patients," Sari F. Edelstein and Martha Chisholm; *Journal of the American Dietetic Association*, Vol. 96, No. 11, November 1996, pp. 1181-1182. Address: Sari F. Edelstein, 501 Alhambra Circle, Coral Gables, FL 33134.