

The ACE IntelliGym: Strategy from Scratch



Introduction and the main dilemma

"In the game of basketball it is not about who runs faster or jumps higher, but about who makes better decisions and fewer mistakes. This is the first time I see a training tool that can actually improve game intelligence skills of basketball players..."

Hubie Brown, Hall of Fame, Coached 3 NBA Teams, ESPN Basketball Analyst

All over the world people participate in team sports, some for leisure and others compete. Professional players are admired around the world and many young players dream that one day they, too, will be rich and famous like their idols. Traditionally, those who are more driven put in more training hours, improving their bodies and their technique. Then they hope that they have the necessary talent and a little luck.

Now this is changing and those hoping to make it big in the game of basketball are finding themselves training what was thought to be untrainable, their brains. They are using a training method that has helped Israeli combat pilots, considered by many to be among the best in the world, improve their flight performance. A group of Israeli entrepreneurs have taken this tool and created a training game for basketball. Done without a ball, a gym or physical exertion, this training helps improve game intelligence, once considered a given talent, and improves actual performance by as much as 30%.

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The entrepreneurs established Applied Cognitive Engineering (ACE), a small Israeli company specializing in computer-based cognitive simulation training, in the summer of 2003. Their first product, the Basketball IntelliGym™, was launched in the USA market in 2004. Their dreams and expectations for the start-up during the launch were as dramatic as the results achieved by the teams and players using the product. After all they had a one of a kind product producing quantifiable improvements that no other training tool could provide.

Contrary to expectations, by early 2008 it was clear that the Basketball IntelliGym business was not developing according to plan. The product had penetrated Division 1 college teams and was being used by more than 20 teams with great effect on the results they were getting. Following the college level penetration the company started selling to high schools and individual consumers. No longer considered a start-up, it was self-sufficient but still employed only four people and relied on outsourcing for all its peripheral needs, such as software development and distribution, with only the core expertise, such as the cognitive work and market development, kept in house. Sales were far below expectations with no foreseeable breakthrough in revenues. It was clear that a substantial investment would be needed to boost sales and income.

With this understanding, the ACE team chose another direction. The Basketball IntelliGym would not be getting additional funds or attention. Instead they decided to channel the lessons learned while marketing the Basketball IntelliGym and the company knowledge to a new field of sport and created the Hockey IntelliGym™. The hockey product would enjoy a few advantages over the basketball product, such as the use of the acquired experience, a strong strategic partner and a new business model. Hopes were high again.

Now, as the reality of the Hockey IntelliGym started to unfold, ACE management team realized they needed to prepare their future plans and be ready for the opportunities and markets, since there would not be a third opportunity. They needed a clear business model for the coming five years. How should they execute it? What were the funding alternatives? What contingency plans must they prepare? And most important of all what should the company aim for?

Brain training

The human brain

As the command and control center of the body, the highly complex human brain is the center of the nervous system. The dominant structure of the brain is called the cerebrum, which is divided into four lobes on two hemispheres (right and left) and controls higher mental functions, such as thinking. Different areas of the brain are responsible for different functions. Neurons are responsive

cells that process and transmit information by electrochemical signaling. Neurons are capable of sending signals to each other over long distances by means of axons, thin fibers that extend from the cell body and project, usually with numerous branches, to other areas using specialized junctions called synapses.

Research from the last couple of decades has resulted in a major shift in the understanding of the human brain, the way it develops and functions. It is now known that the brain is a dynamic system, constantly changing, adapting, reorganizing and regenerating in reaction to stimulation such as learning and experience. The brain is no longer regarded as having a fixed capacity that can only degrade with time, but rather as a dynamic system that can reshape itself, creating new neurons and synapses, throughout a person's lifetime, given the correct stimuli. In a sense the brain is very similar to a muscle, improving performance in reaction to task-specific stimulation. It is, therefore, quite clear that just like a muscle the brain can be trained.

In order to be effective, brain training must be novel, varied and challenging. Of course a balance is necessary; the practice must be unfamiliar enough to promote learning but not so much as to be totally alien. It must have enough variety to keep the trainee from boredom, but stay away from over stimulation which is distracting. It has to be continually challenging but never too hard. Software-based brain training programs seem to be the best suited format to deliver the precise personalized mix of novelty and variety at constantly evolving levels of difficulty that ensure constant challenge.

Cognitive brain training (Exhibit 1)

Cognition, which is the way a person understands and reacts to the world, is usually referred to as thinking and performance. It consists of different mental processes that are based on specific brain structures. Cognition is a part of every human action and cognitive abilities are needed to carry out daily tasks. Cognitive processes and skills include perception, attention, memory, motor coordination, language and auditory processing, visual and spatial processing and executive functions. Executive functions enable goal-oriented behavior and include problem solving, decision making, working memory, emotional self-regulation, inhibition, sequencing and more.

Some cognitive capabilities, such as lexicon, improve over time. These are mostly capabilities that rely heavily on accumulated experience. Other areas, such as working memory and processing speed, typically peak at early adulthood and then decline over time. This is most apparent with cognitive skills which test the capacity to learn and adapt to new environments.

Cognitive training, a subset of brain training, is the process of deliberately employing one or more cognitive skills in order to improve its performance in general or for specific tasks. Studies show that no matter our age, we can train and improve cognitive abilities such as memory, attention, reasoning, etc, reducing and reversing natural decline. Cognitive functions that can be trained include: visual and auditory processing, working memory, attention, and decision making.

While research suggests that there are some overall cognitive benefits to playing any video games such as peripheral vision, pattern recognition, systemic thinking, and the obvious hand-eye coordination, computer-based cognitive training is far more than a video game, even if it looks and feels just like one. Of the various options for cognitive training, computer-based cognitive training has the highest personalization capabilities since it can automatically adjust to the trainee's abilities and progress, in addition to affording automatic feedback and follow-up. These capabilities make it a very efficient and effective tool. Cognitive simulation training aims to recreate the mental and cognitive processes that occur in the brain in real time performance in order to improve them.

Any kind of training, including cognitive and simulation training, which is aimed at improving performance, must measure transfer – the amount of improvement measured in the training facility that is then measured in real life performance. Transfer is considered positive when actual performance improves and negative when actual performance is degraded.

High-fidelity simulations, such as flight simulators, can be very expensive and complex, sometimes even costing as much as the real thing, which may limit the access to training. Moreover, the whole effort may be useless, given that some important features can not be replicated (such as gravitation free tilted or inverted flight), and even result in negative transfer, because learners pick up on specific training features or sensations that do not exist in the real situation. So, while high-fidelity simulators create a very good representation of the “truth”, given their limitations, they are sometimes better for practicing procedures than for creating or improving skills, since negative transfer could lead to incorrect real time decision making.

Cognitive brain training for decision making

Cognitive processes and skills overarch, interact and support each other. The cognitive skill of decision making, an executive function, is heavily interrelated to other cognitive skills and especially so in highly complex situations and when time is a factor. In these situations the end result is dependant not just on the person's ability in each cognitive function but on the ability to work them together. For cognitive training to be relevant and effective in such situations it must transfer correctly to real life. Based on empirical data the transfer achieved by training each

cognitive skill separately is relatively low, in comparison to complex training where multiple cognitive skills are worked together.

Seeking the opportunity (Exhibits 2, 3, 4, 5)

Over the past decade, neuroscientists around the world, from the USA to Japan, Israel, and Sweden, have been working to develop brain fitness software products with commercial applications. The concepts are being commercialized by emerging companies established for the purpose, such as ACE, CogniFit and Posit Science, as well as by established companies, such as Nintendo, who found a connection between their current business and the emerging field. Nintendo has perhaps done the most to spark the commercial adoption of brain fitness products with its Brain Age and Brain Training games. Millions of units have been shipped globally since the 2005 launch.

Less visible than Nintendo's products is the growing number of companies bringing brain fitness products with solid clinical validation to the market. These products are backed by published results based on the gold standard of randomized controlled trials, supported by neuroimaging. As a result, they are able to claim quantifiable short-term improvements to specific cognitive skills if used according to the specific regimen. The results of these teams include a product that has obtained FDA clearance for rehabilitation of Stroke and Traumatic Brain Injury patients. Another product is being used by a growing network of Attention Deficit Hyperactivity Disorder (ADHD) specialists.

Between 2005 and 2007 the USA brain fitness software market more than doubled, reaching \$230 million in 2007, up from an estimated \$100 million in 2005. Over 20 companies are now offering tools to assess and train cognitive skills to four customer segments: general self-improvement products; healthcare and insurance providers; K12 school systems (kindergarten through 12th grade); and other applications including corporate, the military, and sports teams.

General self-improvement products – the biggest growing customer segment in the brain training market has grown from \$5 million in 2005 to \$80 million 2007, with the Nintendo Brain Age phenomenon driving much of the growth. Adults who want to “train their brains” using high-tech games that go beyond the traditional crossword puzzles are among the pioneers of this rapidly growing consumer market. USA baby boomers – many of whom are working more years, living longer, and have experienced a loved one suffer from Alzheimer's disease – have been eager to try new approaches to reduce the rate and impact of cognitive decline.

Healthcare and insurance providers – a growing number of retirement communities, nursing homes and Continuing Care Retirement Communities (CCRC) are offering assorted programs to their residents to expand their usual fitness and social activities. Of these, brain fitness is becoming a

“must have” offering for a wide range of healthcare providers. For example, insurance companies such as Humana and MetLife have taken pioneering steps to disseminate information and brain fitness programs to their members and there are over 400 residential facilities for older adults that have launched computerized “brain fitness centers”. Sales to the healthcare and insurance provider segment grew from \$35 million in 2005 to an estimated \$65 million in 2007. In addition to elderly care this segment covers such areas as stroke rehabilitation and Attention Deficit Disorder (ADD) management.

K12 school systems – Many K12 school administrators have found brain fitness software packages to be useful in helping students with dyslexia and related learning difficulties. Although school districts have a major buying potential for brain training tools this segment is showing slow growth, mostly due to the emphasis being put on academic results rather than skills, cognitive as well as others. In order to gain acceptance with these customers, products need scientific evidence linking brain training as well as the specific product to the academic results sought out by the official comparison tests. The potential for K12 education remains largely untapped due to the limited research linking cognitive training to academic performance. K12 school systems were the largest market segment in 2005, with \$48 million sales, and \$60 million in 2007.

Other segments, such as corporate, military and sport, are just beginning to find brain training useful. These are the smallest customer segments and they are currently growing slowly, though there is a lot of potential.

Corporate – In the USA, Fortune 1000 companies are beginning to look to brain training as an add-on to health and wellness programs, as part of their serious gaming efforts and as a tool to improve task-specific performance. In addition, as the workforce ages in the coming years, brain training is expected to become more valuable to employers, helping them keep older workers highly productive.

Military – The USA military has successful experience with the use of brain training tools, such as cognitive simulation for pilots. Computer-based cognitive training is a small segment that is currently receiving increased attention and funding, not only for training but also for diagnostic and rehabilitation purposes.

Sports – Sports teams and individuals involved in organized sports are just beginning to use brain trainers to improve the skills athletes need in order to excel at their games. The need to win and excel is greatest with ambitious individual youth athletes. They have a well-defined, strong and ongoing need to qualify for a team at the next level. These young athletes, and their parents, are

quite willing to invest in anything that will give them a competitive advantage. If computer-based cognitive training is conceived as creating an advantage for the users it will gain increasing attention and income.

The corporate, military, and sports segments are currently the smallest, estimated together at \$25 million in 2007, compared to \$12 million in 2005. Yet some estimate it may have a major potential to grow given, among other things, aging workforce trends.

Cognitive brain training for decision making

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The IntelliGym – From idea to the market

Stage zero

In 1987, a group of Israeli Air Force (IAF) flight cadets participated in an experiment conducted by Prof. Daniel Gofer, a professor of cognitive psychology and human factors engineering from Israel's Technion. For 10 weeks, in addition to their regular training, they played a video game. With extremely basic graphics it did not resemble anything that could be connected to actually flying a combat plane, or any airplane. Yet at the end of that time period these cadets had improved flight performance, as measured by their flight instructors, by an average of 30%, in comparison to the control group. The cadets continued to outshine the control group all the way to the end of flight school.

The game they were playing is called "Space Fortress", a cognitive training tool that simulated, for them, the way the brain works during combat flight. The game was adapted to simulate the cognitive processes of combat flight – attention control, pattern recognition, decision making and so on, from a video game by the same name that was developed for academic research.

A later study, sponsored by NASA, compared the results of the "Space Fortress" cognitive trainer to those of a sophisticated high-fidelity computer simulation of a Blackhawk helicopter. The "Space Fortress" cognitive trainer was very successful in improving performance, while the high-fidelity

simulator was not. The “Space Fortress” game developed for this experiment is now used, with similar success, in USA military aviation training.

Prof. Gopher had been using the academic version of “Space Fortress” as part of a multinational research project focused on complex learning. This version of the game required the player to simultaneously manage multiple tasks, all of the same importance. The baseline research showed that players tended to use a specialization strategy, concentrating on one task. They displayed a conventional learning curve and managed to improve their score to a certain point, but this was a sub-optimal strategy for the game.

During the research the Israeli center devised a training strategy aimed at teaching players how to balance between the different tasks. The main result of this strategy was an added improvement step in the trainees’ learning curve, above the convergence level achieved at the baseline.

Stage one: Launching the start-up

Following the success of the IAF experiment, two of Prof. Gopher’s former students realized the idea and the process had a commercial potential and at the end of 2002 they decided to start a company to capitalize this potential. The students, Dr. Ya’akov Greenshpan and Dr. Gil Hoppert-Graph had already left the academic world to open a consulting company. The new venture was led by Danny Dankner and Dror Orenshtain and Prof. Gopher agreed to serve on the advisory board.

The team set out to find a suitable market for the technology. It was clear to them that the technology could be applicable for many markets, especially those that require real time decision making under pressure. It was also clear that as a start-up they had to choose a single market to focus on. They needed a niche market with fast sell cycles in order to generate revenues and profits before they ran out of cash. It also had to be a market in which statistics play a major role.

Statistics were imperative. A market rich in statistics is, by definition, a market that has clearly defined and accepted success criteria. These criteria would help the team focus during product development, allowing them to create value for their future customers in the form of a product that would promise capabilities never before heard of or even considered possible. Such claims can become a convincing sale pitch only when backed by data and evidence. The IAF experiment could only supply the initial evidence. Only a market where statistics play a major role will have the necessary data to prove success and buyers with the ability to understand it.

Looking for the right market to target the team considered many options such as military, security and homeland security applications, which were a logical development from the IAF experience, as

well as fields such as stock trading, medical staff and even test preparation. The market that surfaced as having the best fit to their needs was the USA competitive sports market, from which they had to choose one relevant game. Any game, or profession, where the tasks are complex and require fast decision making under pressure would be a good candidate. The USA competitive sports market is built like a pyramid, with a wide base of children's teams and leagues and a small professional league at the peak. This wide base is potentially big enough to allow for profitability. Purchase decisions on teams are free from corporate or government bureaucracy so a fast sale cycle seems a reasonable assumption. Over the years, sports spectators in the USA have gotten used to following not only the game but also the stats, so statistical data about players' and teams' performance was abundant as were models depicting the importance of the different aspects.

Having decided to target competitive sports, the team now had to pick which game to approach first. While globally soccer is, probably, the most popular sport the USA is different. The most popular sports in the USA are, in order, football, baseball, basketball and hockey. In Israel the most popular team sports are soccer and basketball, with the Israeli basketball league perceived as being a high-quality league, regularly participating and winning in European championships. Since the technological risk, the risk of failing to supply measurable results, was high the team decided to reduce other risks and focus on a game that was readily available to them. This would reduce the investment needed for travel, knowledge creation and more. It was therefore decided to develop a trainer for basketball players.

Once the team had a direction they set out looking for venture funding. The new start-up was accepted by an Israeli technology incubator, which invested approximately \$500,000 to finance preliminary development and marketing and supplied basic technical support. These funds were supposed to support the company for up to two years; however the team realized additional funds had to be raised however with limited success until stage two.

Stage two: The basketball market

The USA competitive sport market (Exhibits 6, 7, 8)

In the USA, professional sport teams recruit most of their new players from college teams. College teams recruit from high school varsity teams. Most athletes who are accepted to a college team obtain a college scholarship in the process.

Since college tuition in the USA is very high, especially so in the highly esteemed Ivy League and private colleges, for some households a scholarship is the only way to finance a college education. In addition participation and excellence in sports are highly regarded in the USA, improving a youngster's chances of being accepted by a college of choice, regardless of scholarship issues.

Team members, especially in highly popular sports, are celebrities on campus and many receive press attention at the local and national level. As a result, sport performance is highly regarded and some households will readily invest in order to improve such performance.

There are approximately four million Americans in the 12-17 age group participating in at least one league every year. The average annual spending on equipment per child is about \$1,000. The total annual spending on equipment and training for organized sports is estimated by \$40 billion a year, while the total expense for equipment and gear in wholesale prices in the USA was estimated at nearly \$115 billion in 2007. Colleges spend \$2 billion a year on sport scholarships.

College team players are not considered professional athletes. They may not get paid for participating in the league; they must attend a minimum amount of study meetings, keep their grade average above a certain level and there are limits to the time they can spend training. Products can't be endorsed directly to them or by them.

Teams at all levels are led by a coach, with or without a coaching team. The coach is the decision maker on team purchases and, at school levels, a good contact point for endorsing personal purchases. Yet many coaches are hesitant to give up precious training time and some are not computer savvy at all.

USA basketball

Basketball is a team sport played by two teams of five active players, each trying to score points against the other by propelling a ball through a three meter high hoop, located at the opposite side of the court. The game is highly popular in and outside the USA, with many fans around the world following the top league, the NBA. The game is very rich in statistics. Data is collected, at the team as well as the personal level, about the number of shots, points scored, rebounds, assists, ball lost to opponent team, violations and more.

In the 2007-2008 school year there were over one million USA high school athletes, boys and girls, representing their high school in inter-school games. About the same number of high school pupils were involved in team activities outside their school. The NCAA, which regulates all USA college level sport activities, has a basketball league of about 300 Division 1 teams and over 1,000 other teams. At the professional level, the NBA has 30 teams. It is estimated that overall approximately 35 million Americans play basketball at least once a year. The total USA wholesale expenditure on basketball equipment in 2007 was \$353 million, second only to the wholesale expenditure on baseball/softball.

IntelliGym Development (Exhibits 9, 10)

Product development for the cognitive trainer is generic. The first stage is mapping the task requirements, defining which generic cognitive skills are needed and how they are used when performing a task, such as playing basketball. While the cognitive skills are generic across many tasks, each task requires a different mix of them. Mapping requires specific expertise and takes an average period of about two months.

The computer game is built using the mapped requirements. The game is built to create a simulation of the brain activity needed while performing the task. For basketball this simulation focuses on attention control, task switching, decision making (particularly under extreme duress), long-term concentration retention, pattern recognition, spatial orientation and dynamic anticipation. The game is constructed to train the players not only to improve specific skills but on combining these skills in the correct way for the task. Programming the prototype takes about two months. When the prototype is ready the development team takes it out to the field for testing and fine tuning. This is a long and iterative process that lasts six to eight months.

The Basketball IntelliGym development took almost two years. Currently, using the knowledge accumulated in that process, new developments are expected to be completed in about a year. The cost for creating a cognitive simulation game such as the Basketball IntelliGym starts at \$500,000, based on a basic user interface. In order to create a high level, 3-D user interface, additional investment of at least \$2 million will be needed. As a benchmark, EA Games, a world leader in computer games, invests an estimated \$10 million on the graphics of a computer game. While the cognitive benefit of the game is not impacted by the graphics the fun factor and the marketability of the game are highly dependant of the look and feel of the game.

Once the Basketball IntelliGym development process ended, the team set out to test it and see if they could get results similar to those attained in the IAF experiment. A team from Israel's youth league was selected to train with the game as a beta site. The results were in line with expectations. The players who participated in the cognitive training program subsequently performed better during real time games. Their statistics showed the improvement in assists, points, turnovers and so on. Similar to past experience the improvement was about 30%.

The Basketball IntelliGym is self-explanatory and self-regulating. During the first session the player goes through skill assessment. The training sessions from that point on are based on the player's personal abilities and achievements. Feedback is given throughout the session, comparing the player's current results to those of other IntelliGym players at the same stage. Licenses may not

be shared since this makes it impossible for the program to customize each session to the trainee, based on his or her historical performance.

Playing the game is very intensive and as little as 30 minutes can be enough to generate a level of mental fatigue that requires rest. The optimal training schedule is three sessions a week. Maintenance practice is imperative, as once a player stops using the Basketball IntelliGym, the improvement gradually erode.

While the game can be used offline, online mode is recommended since there is data transfer between the player's station and the company's database. Version updates are automatic when the computer is connected to the web. The product is sold with a twelve-month full money back guarantee supporting the promise of noticeable results.

Basketball teams and individuals using the Basketball IntelliGym have improved their performance significantly. From the cognitive training, or skill development point of view players improve their positional awareness – with regard to themselves, their team mates and their opponents, and their ability to predict what is going on in the game. Players are also able to make faster and better decisions. They quickly develop attention allocation strategies that enable them to better participate in the game, and also improve their spatial orientation.

Marketing

The Basketball IntelliGym is sold to college teams, school teams and to individual consumers, in a multi-tiered sales offer. The individual consumer is offered the standard edition priced at \$99.95 and the gold edition priced at \$189.95. The team packages aimed at high schools are offered in a price range of \$675-\$1250, for a pre-determined number of users. The personal edition can be extended to hold up to three accounts, for an additional charge of \$20 per account. College team packages, which are priced at \$10,000-\$20,000, usually include on-site support and configuration and require an annual renewal fee of 20-25% of the original fee.

NBA players and teams were not targeted since they regard using such tools as endorsement and so require payment for their efforts. ACE did manage to get two NBA players to use and endorse the product. The time and money required to maintain this endorsement was beyond the company's capabilities at the time and it was stopped.

Initial penetration was through personal connections of Gilad Shoham, an Israeli coach and the company's in-house content expert, with USA college level coaches. The first installations, regarded by the ACE team as paid beta sites, were in Memphis and Kentucky in 2004 (Exhibits 11,

12). The good results obtained by the two teams and the endorsement from John Calipari, head coach at the University of Memphis, caught the media's attention. ESPN, CNN/SI, Fox News, Forbes, USA Today, CBS and others reviewed the product favorably. The team was then able to generate more sales at the college level, by personally visiting the relevant coaches and pitching the product. These early installations enjoyed personal attention, with Coach Shoham visiting regularly, motivating the players and resolving any issues.

Selling to college level teams was very costly and time consuming. Income potential was limited, since of the 300 colleges with Division 1 basketball teams, only about half could afford the necessary investment. It was, therefore, decided to focus on the much larger market of high schools and individuals. Initially ACE combined personal sales visits with web-based sales, gradually moving over time to selling solely through the web. The product is currently sold through the company's web site and through affiliated web sites that specialize in basketball training.

By the end of 2007 ACE had installed the Basketball IntelliGym in over 20 colleges. At that point the company decided to stop selling to this segment. By the end of 2008 the company had sold almost 100 high school packages and the total amount of licenses sold was over 10K.

The business arena (Exhibit 13)

Defining the market for the Basketball IntelliGym is complex. IntelliGym is a computer game, a cognitive trainer and a basketball training aid, all in one. It is bought by college coaches, school athletic directors, parent-teacher associations (PTA) and by consumers, usually parents. While each view the product differently, parents are the most likely to view it as a computer game and coaches are most likely to view it as a training aid.

As a computer game, the Basketball IntelliGym's main competitors are the high-fidelity game simulations that are played for recreation. These products are a lot of fun, have a cutting edge look and feel such as 3-D graphics and are usually priced at a much lower price than IntelliGym. While ACE's research has shown that playing a high-fidelity simulation of your game (e.g. an NBA video game such as NBA 09: The Inside by Sony or NBA Live 09 by EA Sports, in the \$50-\$60 price range) had negative transfer, teaching the player incorrect time constants, view points and more, when the training aspect of the Basketball IntelliGym is not of high importance in the purchase decision, the product is at a disadvantage.

As a basketball training aid the Basketball IntelliGym is up against a very wide array of products that offer to improve performance on the court, from shoes through training apparatus designed to improve specific capabilities such as dribble or jump height to DVD training "courses" and training

camps. Some of these products have a limited track record in improving actual performance. The price range in this category is very wide, starting from \$10 for a training aid that helps train at dribbling without looking at the ball and ending with over \$10,000 for special equipment that improves jump height. The product which seems closest to the Basketball IntelliGym is the DVD training; for example, a pack of 4 DVDs each 5 hours long with Magic Johnson training is priced at about \$40 per disc.

As a cognitive trainer there are basically no competing products at this time, since the Basketball IntelliGym is the only brain training product aiming specifically at sport training. It is also quite unique in the holistic approach it uses when training cognitive skills together in a situation that simulates the way players will need to act in real life.

Stage three: The hockey market - Changing the business model (Exhibit 14)

By 2008 it was clear that the Basketball IntelliGym sales were not meeting expectations. Word of mouth was negligible, despite the good results produced. The company ascribed this to the fact that competitive sports are a zero-sum game, which means that players and coaches are reluctant to share success. Direct sales were becoming easy as more and more decision makers became receptive to the product but the company did not have the funds required to support this channel.

ACE has had a lot of offers and requests to develop trainers for other games over the years, but for an investment in a new trainer to be profitable they must achieve deeper penetration faster than they managed to achieve with the Basketball IntelliGym. This could be done by making a greater investment or by partnering with another player in the market. The experience they gained in basketball led them to understand several key success factors for such a partnership. They realized they needed a partner with professional expertise and good commercial reach to the market. It would also have to be similar in size to ensure similarity of the commercial interest. Several games were considered, including ice hockey, and the relevant sport associations were approached.

The negotiations ended with ACE making a strategic agreement with USA Hockey, the national, nonprofit association governing the sport of ice hockey in the United States. Both parties will bring their knowledge and invest time and money in the new product. USA Hockey will be in charge of marketing and will make use of its own marketing and sales channels. ACE will develop the product and set up the sales logistics. The product will not be sold as a lifetime license and is expected to create an income stream. Profits will be shared. The USA national team will be one of the beta sites and the product launch is set to coincide with the 2010 Winter Olympic Games.

The venture will have the support of the BIRD (Binational Industrial Research and Development) Foundation, which will contribute approximately \$800,000 for product development, pending external funding of the same amount.

The hockey market

Ice hockey is a team sport played on ice by two teams, each trying to score goals by shooting a hard vulcanized rubber disc, called a puck, into the opponent's goal net. The players may control the puck using a long stick with a blade. There are five active players and a goalkeeper per team in the hockey rink during the game. It is the national winter game in Canada and is the fourth major North American professional sport.

In USA and Canada, ice hockey is a very concentrated sport (USA and Canada share the professional ice hockey league). USA Hockey manages the leagues, certifies coaches and officials, publishes professional literature and trains 30,000 coaches annually. Nearly 600,000 players, coaches, officials and volunteers from all 50 states are members of USA Hockey.

In the 2007-2008 school year, there were over 45,000 USA high school children, boys and girls, playing ice hockey in school teams. The International Ice Hockey Federation had 466,000 registered players in the USA, as of 2008. Ice hockey players are highly committed to the sport, willing to invest in equipment and training. In the USA the median household income of families with hockey players is more than twice the USA average and their willingness to pay for equipment is high. The total USA wholesale expenditure on ice hockey equipment in 2007 was \$206 million.

Competitive advantage

The IntelliGym trainers are game-changing products, allowing people to train and improve their "game-sense", a set of attributes which was always considered a given talent. It is currently the only product of its type on the market and is protected by patents and by the unique expertise of its developers. There are, probably, around 20 people in the world with relevant expertise for this kind of development. At least three of them are committed to the IntelliGym products.

Part of this unique expertise is the ability, developed by Prof. Gopher and his team, to design holistic trainers. Almost all cognitive trainers on the market focus on training each skill separately, a strategy that has some level of positive transfer. An IntelliGym trainer, on the other hand, has the player training on multiple cognitive skills all at once, using the learning strategy designed in the original Space Fortress experiment. The positive transfer achieved by this strategy is significantly larger.

Being the first to market ACE had to educate the whole market – coaches, educators, parents, reporters and players. Now they are reaping the rewards. They have created a great rapport with many of these market players by supplying the promised results. Selling the next trainer to these customers and their peers will be fast and easy in comparison to the sale of the Basketball IntelliGym.

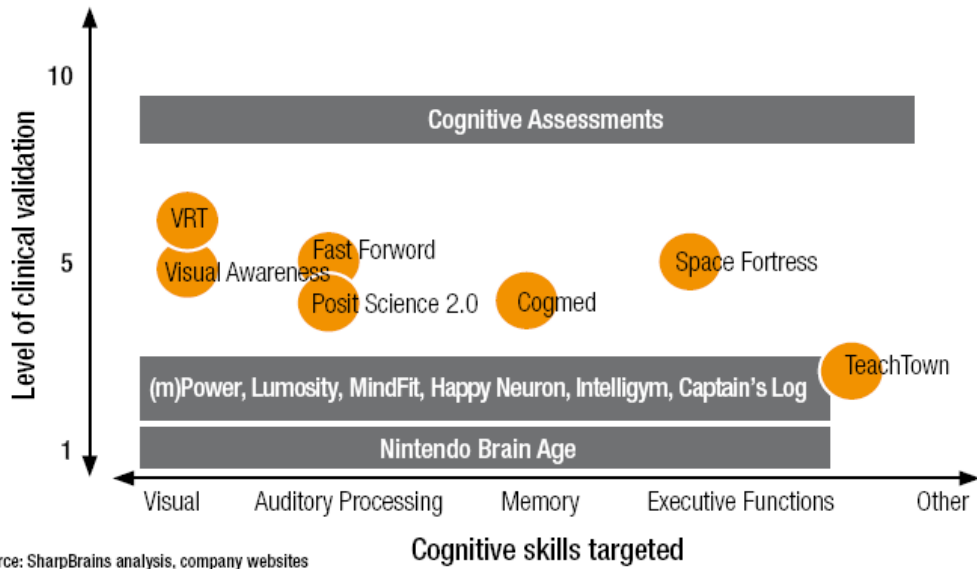
Making the leap

The Hockey IntelliGym is expected to launch in early 2010. While USA Hockey and ACE are busy preparing for this launch, ACE has to make sure it is ready for whatever lies ahead. The Basketball IntelliGym will continue to generate sales at its own pace. The Hockey IntelliGym will be launched and while the hopes for it are high no one knows how it will be accepted in the market. Once it is launched – then what? Should they wait? For what? Should they continue with cognitive trainers for team sports or should they head else where? How should this be done? What threats should they prepare for? After all, after five years in the market they are no longer considered a start-up company. It is time to find a way to make the next and crucial jump from a grown start-up of four people to an established company that will lead the industry it created. The main dilemma remains – how?

The company has to decide what business model it will use, in what markets, where it will be getting funding and how it will recruit partners. It must also map the risks ahead and plan for them.

Appendixes

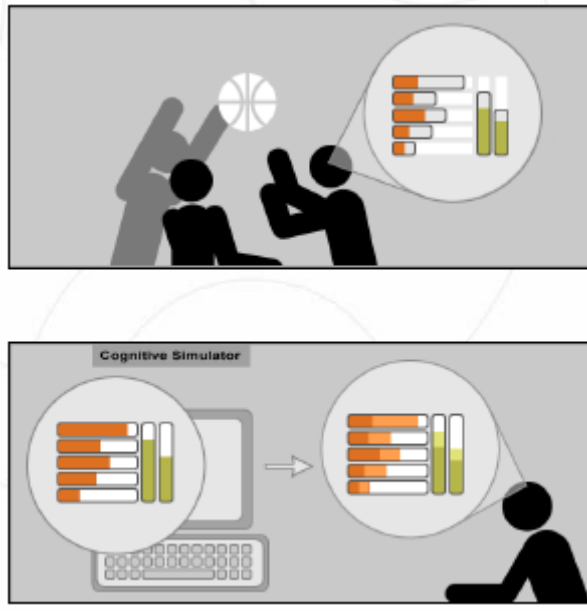
Exhibit 1: Level of clinical validation of cognitive software products



Source: SharpBrains analysis, company websites

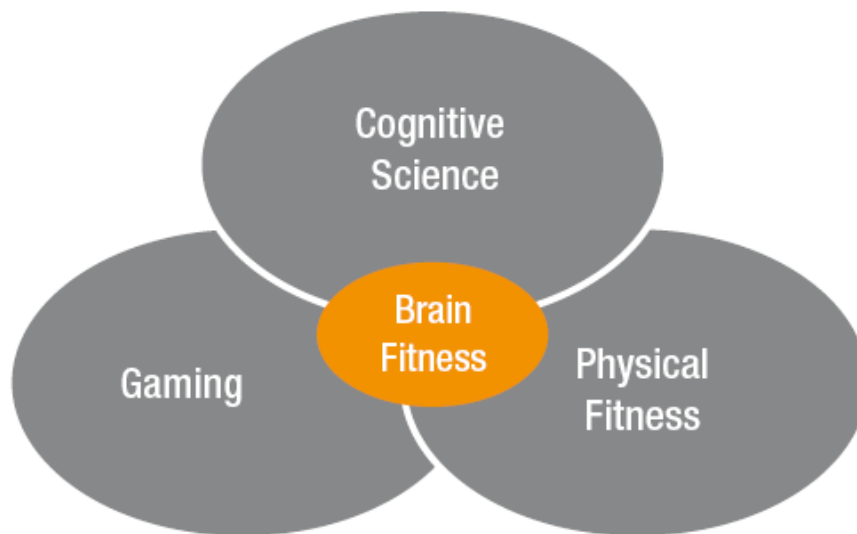
Source: Company data

Exhibit 2: Cognitive Simulation



Source: Company data

Exhibit 3: Brain Fitness Market



Source: SharpBrain research 2008¹

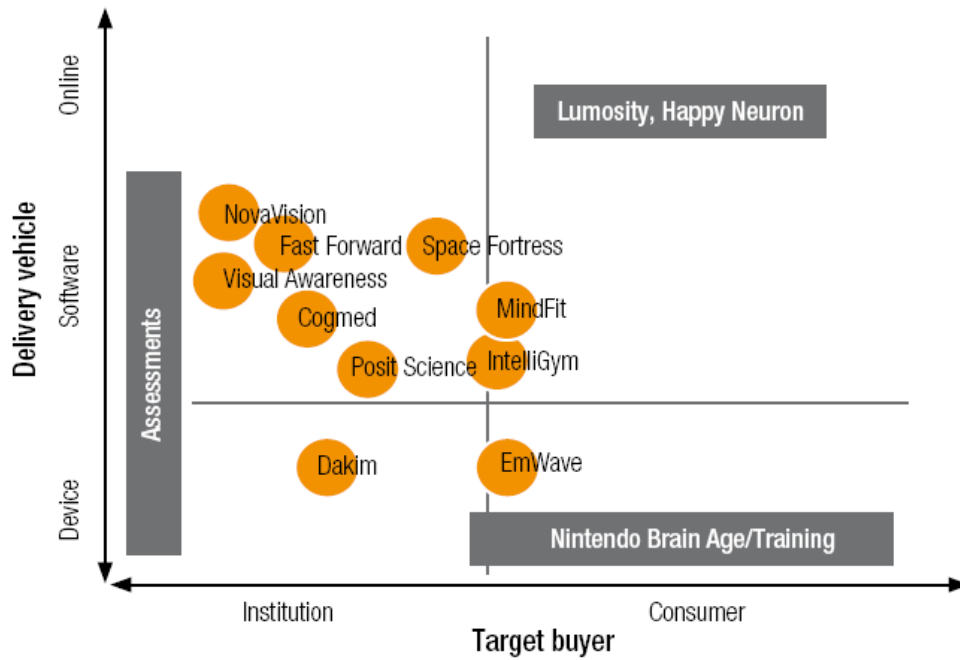
Exhibit 4: Brain fitness customer segments

Customer Segment	\$ USA m 2005E	\$ USA m 2007E	Selected Companies	Value Proposition of Brain Fitness Programs
General self-improvement products	5	80	Nintendo, Lumos Labs, CogniFit, Posit Science	Contribute to health aging
Healthcare & Insurance providers	35	65	NovaVision, Posit Science, Dakim, Cogmed, BRC, CDR, CogState, CNS Vital Signs	Assess and train cognitive skills to identify/ help alleviate cognitive symptoms
K12 school systems	48	60	Scientific Learning, Earobics	Help to solve cognitive bottlenecks such as dyslexia
Corporate – Fortune 1000 companies; military & sport teams	12	20	ACE, CogniFit	Enhance professional task-related performance, such as decision making

Source: SharpBrains research 2008

¹ The authors would like to thank Mr. Alvaro Fernandez CEO & Co-Founder, SharpBrains for the permission to use data from SharpBrains research 2008

Exhibit 5: Brain fitness software usage map



Source: SharpBrains research 2008

Exhibit 6: Total sport participants, participating at least once a year by age in the USA, 2006 - in thousands

Age	Ice Hockey	Basketball	Football	Soccer	Volleyball	Tennis
6-11	433	7,626	3,225	7,134	1,924	1,622
12-17	761	7,953	5,945	4,568	5,250	2,115
18-24	495	4,802	3,933	2,053	3,034	1,053
25-34	1,228	4,187	3,573	962	4,259	1,165
35-44	390	3,390	962	1,102	2,756	1,840
45-54	273	1,717	503	458	1,981	1,426
55-64	64	794	154	89	370	470
65+	4	512	37	127	398	968

Exhibit 7: number of high school athletics participation in inter-school formal games, USA,

2007-2008 school year

	Boys		Girls		Total
	Number of schools	Number of participants	Number of schools	Number of participants	Number of participants
Archery	45	990	43	544	1,534
Badminton	213	4,093	431	11,361	15,454
Baseball	15,720	478,029	154	1,010	479,039
Basketball	17,861	552,935	17,564	449,450	1,002,385
Bowling	2,261	26,353	2,321	25,391	51,744
Canoeing	58	1,181	61	1,304	2,485
Competitive spirit squads	560	2,673	4,510	111,307	113,980
CREW	97	2,555	94	2,400	4,955
Cross country	13,485	221,109	13,294	190,349	411,458
Dance/ drill	3	6	57	975	981
Equestrian	51	214	165	1,314	1,528
Fencing	96	1,884	102	1,852	3,736
Field hockey	18	408	1,760	62,557	62,965
Flag football	7	251	168	5,148	5,399
Football – 11 player	13,987	1,108,286	255	1,225	1,109,511
6-player	196	4,534	3	9	4,543
8-player	723	16,311	21	88	16,399
9-player	275	6,230	5	7	6,237
Golf	13,647	159,958	9,447	69,243	229,201
Gymnastics	115	2,140	1,454	18,058	20,198
Ice hockey	1,564	36,667	534	8,621	45,288
Judo	45	705	45	361	1,066
Lacrosse	1,815	82,860	1,624	61,086	143,946
Riflery	218	2,232	176	1,062	3,294
Skiing – alpine	573	5,824	543	4,711	10,535
Skiing – cross country	416	4,438	396	4,461	8,899
Snowboarding	49	824	45	432	1,256
Soccer	11,122	383,561	10,543	346,545	730,106
Soft tennis	20	390	22	455	845
Softball – Fast pitch	63	1,335	14,846	371,293	372,628
Softball – Slow pitch	2	67	719	14,709	14,776
Swimming and diving	6,428	111,896	6,766	147,197	259,093
Team Tennis	1,342	27,061	1,383	28,776	55,837
Tennis	9,576	156,285	9,694	172,455	328,740
Track and field – indoor	3,095	67,213	2,659	59,832	127,045
Track and field – outdoor	15,835	548,821	15,772	447,520	996,341
Volleyball	2,006	46,780	15,009	397,968	444,748
Water polo	698	18,032	712	17,773	35,805
Weightlifting	691	21,887	366	7,630	29,517
Wrestling	10,090	259,688	1,287	5,527	265,215
Other	260	3,204	316	2,919	6,123

Source: Company data,

Exhibit 8: US wholesale sales by category, manufacture shipments \$ 2008 million

	2006	2007
Total baseball/ softball	527	534
Total Basketball	352	353
Billiard	234	227
Bowling	206	200
Archery	350	357
Paintball	370	300
Camping	1,659	1,686
Firearms	2,204	2,307
Fishing	1,668	1,751
Football	474	491
Golf	2,972	2,988
Ice hockey	200	206
Optical goods	1,100	1,155
Racket ball	13	15
Scuba & skin diving	270	278
Ski	510	544
Soccer	300	310
Tennis	245	261
Table tennis	45	46
Lacrosse	35	36
Volleyball	51	54
Water sports	425	437
Boxing	100	105
Martial arts	280	314
Other	6,146	6,269
Total sports equipment	20,757	21,245
Total exercise equipment	4,662	4,699
Athletic footwear	12,327	12,952
Of them basketball footwear	1,007	1,015
Sporting apparel items	28,822	29,502
Of them basketball team uniforms	183	184
Licensed merchandise	8,258	8,877
Recreational transport	39,852	37,468
Total	114,678	114,742

Source: Company data

Exhibit 9: The Basketball IntelliGym software kit

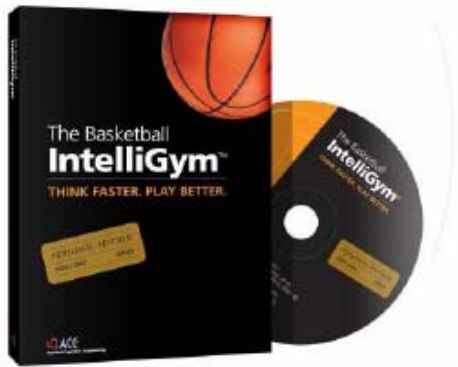
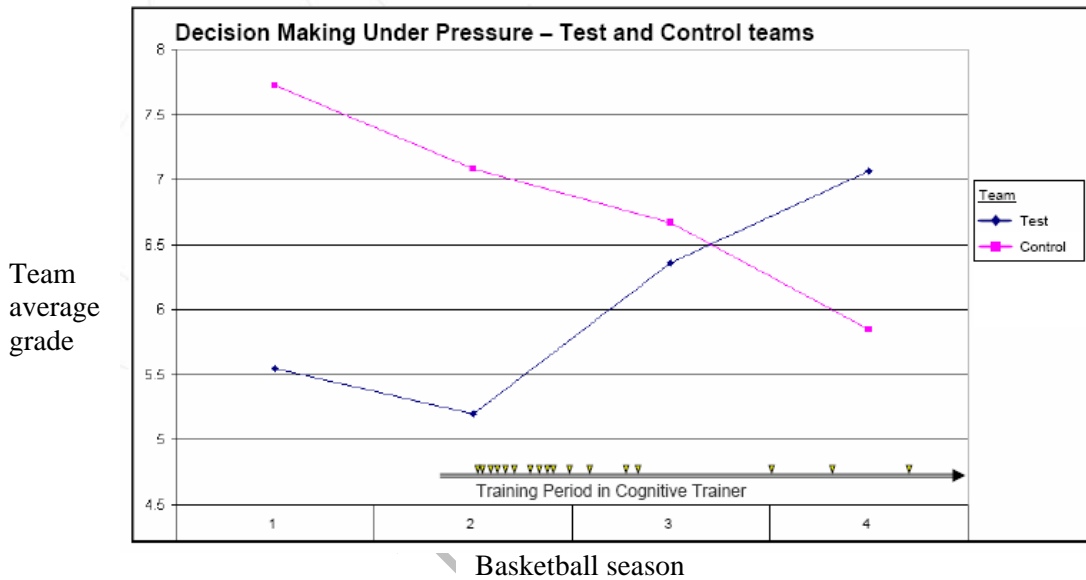


Exhibit 10: Decision making under pressure, average grade team received by judges along basketball season



Source: Company data

Exhibit 11: Memphis' offence improvement

	Field goals	Field goals attempt	3 point field goals	3 point field goal attempt	Free Throws	Free throw attempt	Rebound tot	Assists	Turn overs	Points
Memphis before the IntelliGym	22.3	59.7	5.7	19.5	14.2	21.3	39.3	10.4	15.4	64.5
Memphis after the IntelliGym	24.5	54.9	7.2	19.7	18.1	26.2	37.9	12.7	14.5	74.3
Difference	2.2	-4.8	1.5	0.2	3.9	4.9	-1.4	2.3	-0.9	9.8
% improvement	9.9	8.7	26.3	1	27.5	23	3.6	22.1	5.8	15.1

Source: Company data

Exhibit 12: Memphis' defense improvement

	Field goals	Field goals attempt	3 point field goals	3 point field goal attempt	Free Throws	Free throw attempt	Rebound tot	Assists	Turn overs	Points
Opponents before the IntelliGym	23.6	59.7	5.4	16.7	15.4	21.9	38.5	14.3	14.3	68.0
Opponents after the IntelliGym	21.0	55.5	6.2	18.8	16.3	24.3	34.1	11.0	14.4	64.5
Difference	-2.6	-4.2	0.8	2.1	0.9	2.4	-4.5	-3.3	0.1	-3.5
% improvement	11.0	7.0	9.5	12.6	5.8	11.0	11.7	23.1	1	5.1

Source: Company data

Exhibit 13: Main Competitors in the cognitive market

Nintendo

Founded on September 23, 1889 by Fusajiro Yamauchi in Kyoto, Japan, to produce handmade Hanafuda cards the company entered the video gaming field in 1974. Today Nintendo Co., the worldwide innovator in the creation of interactive entertainment, manufactures and markets hardware and software for its Wii™, Nintendo DS™, Game Boy® Advance, PlayStation 3 and Nintendo GameCube™ systems. Since 1983, Nintendo has sold nearly 2.7 billion video games and more than 420 million hardware units globally, accounting for \$16.7 billion in 2008, and has created industry icons like Mario™, Donkey Kong®, Metroid®, Zelda™ and Pokémon®. In addition to selling hardware the company promotes an array of software products at average prices of \$19-\$49. In the field of cognitive training Nintendo offers several products: Brain Age, Brain Training, and Brain Academy for Nintendo DS and Wii but does not claim any scientifically proven effects of using the game. The products offer a variety of stimulating games, without specific information on what cognitive skills are being trained. Company sales of cognitive software were estimated at less than \$65 million in 2007.

Lumos Labs

Founded in 2005 in San Francisco, Lumos Labs is a cognitive neuroscience research and development company that builds software tools for improving brain health and performance, focusing on scientific brain training games which improve memory, attention processing speed and control. Lumos Labs Lumosity is its first general brain fitness program.

The Lumosity brain games focus on training the mind in an interactive environment. They are a fast, fun, and effective way to improve cognitive performance and brain health. They are short and fit into a daily 10-minute session. Lumos Labs sales for 2007 were estimated less than \$1 million.

Scientific Brain Training

Established in 2000 with around \$15-20 million in market capitalization, Scientific Brain Training is a public company, based in France, with a US office in Mountain View, California. The company, which posted an estimate of \$1 million sales in 2007, offers separate online games that exercise each of the cognitive fields of memory, attention, processing speed and cognitive control for a cost of \$9.95 per month and \$99.95 per year.

CogniFit

Established in Israel in 1999, with offices near Haifa, Israel, in Paris and Seattle, Washington, this company first focused on the improvement of cognitive driving related skills. Today the company also offers a self-adapting tool for healthy aging. The company posted an estimate of \$5 million sales in 2007 from both product lines.

The company's first product was designed to improve the cognitive skills that are involved in driving and it is now used to train driving students in high schools throughout Israel. Since then, CogniFit has produced a variety of applications that combine updated brain research, advanced technology and communication techniques in order to assess, train, and enhance the 14 key cognitive abilities that are, according to company research, essential to optimum brain fitness. CogniFit brain fitness programs begin with a personal assessment that determines the state of cognitive health and then creates a training system that continuously charts progress and adapts itself to the client's changing needs. No two people follow the same CogniFit brain fitness program. The product with the healthy aging tool is sold at a cost of \$14.95-\$19.95 per month.

NovaVision

NovaVision, Inc., headquartered in Boca Raton, Florida, researches, develops and provides scientifically based, innovative neurostimulation medical devices and comprehensive technologies to noninvasively restore the vision of patients with neurological visual loss. NovaVision's patented, FDA-cleared Vision Restoration Therapy (VRT) maps areas where vision may be improved, and then provides customized neurostimulation therapy to regions within the brain's vision centers. The company product, FDA 510(k) approved, is a daily at-home therapy for stroke and traumatic brain injury (TBI) survivors. Visual field defects treated with NovaVision VRT include hemianopia, quadrantanopia and scotoma, which affect approximately 2.2 million stroke and TBI survivors in the USA alone.

Nova vision is estimated to have sold \$5 million units in 2007, and has raised \$40 million in three rounds since 2003, as it obtained FDA 510(k) approval.

Posit Science

San Francisco based Posit Science, founded in 2003, is a rapid growing company with sales up from \$6 million in 2006 to \$12-\$16 million 2007. The company raised over \$20 million in venture capital and aims to address cognitive issues related to healthy aging and a broad range of other conditions, including Alzheimer's disease, mild cognitive impairment, schizophrenia, and chemobrain. The company's main product, the InSight online game, specializes in improving auditory processing by sharpening the quality and quantity of information the brain absorbs from its surroundings.

InSight aims to improve everyday activities, like driving safely and confidently, watching kids running around a playground, finding the car in the parking lot, and avoiding accidents, by improving the clients' awareness of their surroundings, and inducing faster reaction and better memory. The Brain Fitness Program features six computer-based exercises for use on a PC or Mac. These exercises are designed to be very easy to use, even for computer novices. The exercises adapt to the individual level, and give constant feedback about progress.

Dakim

Established in 2002 in Los Angeles, California, the company develops a product which works on a variety of cognitive skills and fights Dementia and Alzheimer. Selling its product for several thousand dollars per unit, including hardware, software and service for institutions, Dakim raised \$10.5 million in February 2008.

Cogmed

Cogmed is a privately held company founded in Stockholm, Sweden, in 2001. The founders are two neuroscientists at the Karolinska Institute in Stockholm and two game developers. The company develops and markets software-based working memory training products for improved attention. Cogmed training provides substantial and lasting improvement in attention for people with poor working memory, in all age groups from ADHD children to adults.

Cogmed's main markets are Sweden and the USA. It has been active in the USA since 2006, with offices in Naperville, Illinois. Cogmed works with practices across the USA and Canada, and also has partners in Japan and several additional countries around the world. Products are sold to clinics for over \$1,500 per unit, accumulating to an estimated \$1 million in 2007.

Cognitive Drug Research

CDR, founded in Richmond, Virginia, in 1989, manufactures a cognitive assessment product. Its sales were less than \$5 million 2007. The computerized CDR system assesses the major aspects of cognitive function known to be influenced by medicines and disease: attention/concentration, short-term working memory and long-term episodic secondary memory.

Responses to a standardized battery of tasks are measured with true millisecond precision using CDR's proprietary Yes/No response box, allowing a typical comprehensive cognitive profile to be obtained in around 18 minutes. The system does not require administration by specialist staff. The core battery of assessments can be supplemented as required with a variety of other tests which are either fully computerized or computer assisted. All data is recorded automatically and securely, and correlated with CDR's large normative database to assess effects.

CNS Vital Signs

Established in 1986, UK based, with offices in Chicago, CNS Vital Signs offers neurocognitive batteries for large-scale clinical trials. CNS Vital Signs™ neurocognitive assessments offer the clinician a useful tool for making neurocognitive status assessments that, with interpretation, can be used in the evaluation and management of patients. Company sales for 2007 were estimated at less than \$5 million.

Source: Company data

Exhibit 14: Ice Hockey international survey of players 2008

Federation	Registered Players			Population
	Total	Senior	Juvenile	
Andorra	86	37	38	72,413
Armenia	575	395	180	2,968,586
Australia	3,048	1,669	1,152	20,600,856
Austria	9,789	4,614	5,175	8,205,533
Belarus	3,160	960	2,200	9,685,768
Belgium	1,752	753	905	10,403,951
Bosnia &	260	80	180	4,590,310
Bulgaria	378	128	194	7,262,675
Canada	558,173	147,280	333,432	33,212,696
China	543	263	280	1,330,044,605
Chinese Taipei	808	325	408	21,003,976
Croatia	609	123	486	4,491,543
Czech Republic	94,876	58,951	34,032	10,220,911
Denmark	4,961	1,671	1,987	5,484,723
DPR Korea	1,575	450	610	23,479,089
Estonia	1,854	795	939	1,307,605
Finland	61,684	21,746	36,411	5,244,749
France	16,930	5,485	9,898	64,057,790
Germany	29,465	8,907	18,077	82,369,548
Great Britain	5,978	1,313	3,915	60,943,912
Greece	367	245	100	10,722,816
Hong Kong	182	80	67	7,018,636
Hungary	2,076	512	1,418	9,930,915
Iceland	580	93	443	304,367
Ireland	411	310	70	4,156,114
Israel	500	120	380	7,112,359
Italy	7,075	2,054	4,638	58,145,321
Japan	20,349	12,056	6,756	127,288,419
Kazakhstan	4,716	537	4,095	15,340,533
Korea	1,140	68	995	49,232,844
Latvia	4,463	3,023	1,384	2,245,423
Liechtenstein	104	82	22	34,498
Lithuania	660	253	407	3,565,205
Luxembourg	320	150	160	486,006
Mexico	1,900	400	1550	109,955,400
Mongolia	154	66	44	2,996,081
Netherlands	2,946	1,686	1,260	16,645,313
New Zealand	1,510	800	600	4,173,460
Norway	6,381	1,708	4,263	4,644,457
Poland	2,095	362	1,515	38,500,696
Portugal	85	48	26	10,676,910
Romania	1,500	325	1,100	22,246,862
Russia	82,967	25,960	56,750	140,702,094
Serbia	645	121	521	10,159,040
Slovakia	9,870	1,950	7,657	5,455,407
Slovenia	978	366	553	2,007,711
South Africa	399	98	242	43,786,115
Spain	1,150	425	645	40,491,051
Sweden	65,178	16,110	45,435	9,045,389
Switzerland	24,449	10,264	13,433	7,581,520
Thailand	200	80	100	65,493,298
Turkey	790	310	320	71,892,807
Ukraine	4,190	668	3,522	45,994,287
United Arab	195	85	100	4,621,399
USA	466,300	102,611	304,580	303,824,646

Source: International Ice Hockey Federation

Exhibit 15: Soccer international survey of players 2008

Association	All Players	Registered players	Unregistered Players	Clubs	Officials
China PR	26,166,335	711,235	25,455,100	2,221	129,057
USA	24,472,778	4,186,778	20,286,000	9,000	796,300
India	20,587,900	384,900	20,203,000	6,540	38,640
Germany	16,308,946	6,308,946	10,000,000	26,837	159,172
Brazil	13,197,733	2,141,733	11,056,000	29,208	61,000
Mexico	8,479,595	324,595	8,155,000	311	85,789
Indonesia	7,094,260	66,960	7,027,300	83	1,069
Nigeria	6,653,710	58,710	6,595,000	52	33,122
Bangladesh	6,280,300	271,300	6,009,000	4,100	75,604
Russia	5,802,536	846,736	4,955,800	14,329	259,830
Italy	4,980,296	1,513,596	3,466,700	16,697	78,481
Japan	4,805,150	1,045,150	3,760,000	2,000	249,603
South Africa	4,540,410	1,469,410	3,071,000	900	20,557
France	4,190,040	1,794,940	2,395,100	20,062	285,723
England	4,164,110	1,485,910	2,678,200	42,490	168,186
Ethiopia	3,474,245	56,245	3,418,000	1,004	310,600
Egypt	3,138,110	52,110	3,086,000	608	18,270
Colombia	3,043,229	291,229	2,752,000	2,773	15,800
Pakistan	2,975,400	64,400	2,911,000	720	9,900
Spain	2,834,190	653,190	2,181,000	18,190	62,573
Turkey	2,748,657	197,657	2,551,000	4,450	208,027
Canada	2,695,712	865,712	1,830,000	10,000	189,624
Argentina	2,658,811	331,811	2,327,000	3,377	37,161
Chile	2,608,337	478,337	2,130,000	5,762	26,374
Congo DR	2,515,600	77,600	2,438,000	770	10,600
Ukraine	2,273,017	692,317	1,580,700	70	15,580
Kenya	2,041,102	75,102	1,966,000	711	52,010
Guatemala	2,000,264	154,649	1,852,000	139	5,403
Poland	2,000,264	656,964	1,343,300	5,891	71,758
Peru	1,891,790	238,790	1,653,000	2,100	4,182
Vietnam	1,874,350	24,150	1,850,200	35	10,652
Iran	1,806,544	449,644	1,356,900	120	25,800
Algeria	1,790,200	203,900	1,586,300	2,090	24,500
Netherlands	1,745,860	1,138,860	607,000	4,856	11,238
Philippines	1,668,765	30,675	1,638,090	85	299
Morocco	1,628,016	165,016	1,463,000	599	8,651
Sudan	1,567,300	46,300	1,521,000	440	8,800
Venezuela	1,490,573	60,173	1,430,400	920	9,132
Mali	1,391,625	14,175	1,377,450	140	6,078
Thailand	1,298,000	28,600	1,269,400	150	6,600
Uganda	1,191,514	46,514	1,145,000	402	5,600
Cuba	1,141,825	46,425	1,095,400	353	5,255
Myanmar	1,122,039	132,659	989,380	605	3,750
Korea Republic	1,094,227	31,127	1,063,100	100	4,648
Costa Rica	1,084,588	50,588	1,034,000	254	4,866
Czech Republic	1,040,357	686,257	354,100	4,108	12,881
Paraguay	1,037,435	87,435	950,000	1,709	4,002
Romania	1,034,320	108,620	925,700	2,832	20,883
Ecuador	1,029,655	30,855	998,800	201	4,455
Zambia	1,024,817	29,211	995,606	918	11,559
Sweden	1,006,939	552,939	454,000	4,236	24,950
Ghana	987,500	27,500	960,000	280	5,200
Australia	970,728	435,728	535,000	3,868	67,632
Austria	967,281	596,281	371,000	2,311	39,202
Mozambique	885,700	35,700	850,000	170	6,100
Madagascar	826,420	30,420	796,000	220	4,788
Belgium	816,583	443,383	373,200	2,058	79,645
Côte d'Ivoire	801,700	23,200	778,500	220	4,500
Cameroon	785,515	22,045	763,470	223	7,776
Greece	760,621	359,221	401,400	5,768	13,330
Uzbekistan	730,200	36,900	693,300	216	1,325
Angola	664,690	16,440	648,250	103	2,059
Senegal	661,685	176,685	485,000	195	5,024
Zimbabwe	651,400	34,600	616,800	350	3,100
Slovakia	622,668	428,968	193,700	2,432	18,773
Burkina Faso	605,100	23,200	581,900	100	3,100
Malaysia	585,730	9,930	575,800	110	11,810
Bolivia	578,800	57,200	521,600	897	3,300
Switzerland	571,700	232,700	339,000	1,806	257,783

Source: Federation International Football Federation