

Computer Games for Anger Regulation in Children with Chronic Illness

Manijeh Firoozi¹, Mohammad Ali Besharat²

^{1&2}Department of psychology & Education, University of Tehran, Iran
E-mail: manijeh_firoozi@hotmail.com, besharat2000@gmail.com

Abstract: Anger has been identified as result of physical illness. Expression of anger, if lead to control anger, is a properly way to sustain physical and psychological health. The purpose of study was compare efficacy of computer game and interference in mental image as two techniques to control anger. Cancer, Tourette's syndrome and healthy groups took part in the intervention programs. The Anger Expression and Disruptive Behavior were applied to evaluate anger regulation level in children. Despite the intervention groups displayed deference in some subscales with healthy group, but they showed significantly difference between before and after intervention. This difference was stable one month after intervention. Children with chronic illness are not able to distinguish the anger goals and correctly applying the words to reduce anger. Manijeh Firoozi, Mohammad Ali Besharat.

[Manijeh Firoozi, Mohammad Ali Besharat. **Computer games for anger regulation in children with chronic illness.** *Life Sci J* 2013;10(1):2903-2908] (ISSN:1097-8135). <http://www.lifesciencesite.com>. 352

Key Words: child, chronic disease, therapy, technology, drawings.

1. Introduction

Major advances in medical technology, such as chemotherapy, bone marrow transplantation, and immunotherapy and many intensive treatments one hand and pain, various deprivations, disability and resident in hospital for long time on the other hand, can cause distress and anger in children with cancer (Jacobs & Kronaizl, 1991). Studies demonstrated children with serious chronic illness in the whole and children with cancer in the specific, reported significantly higher levels of defensiveness or repressive adaptive style than healthy control participants. Important point is that the repressors reported less anger expression (Phipps & Steele, 2002). Findings reveal that these children internalize their anger. Association internalized anger or "Anger in" with many medical and psychological problems has studied in several investigations. For example, "anger in" relate to elevated blood pressure (Hauber et al., 1998). Also, "anger in" may be a risk factor for weekly performance of immune system (Penedo et al., 2006). Base on other studies, anger internalizing is not common for all cases. For example, Tourette's syndrome (TS) has been associated with increased anger and higher score in cognitive and behavior impulsivity (Sukhodolsky et al., 2003). Children with Tourette's syndrome (TD) externalize their anger and show disruptive behaviors (Sukhodolsky et al., 2007). Externalized anger decreases level of psychological and social adaptation (Fraguas et al., 2007). "Anger out" was positively correlated with anxiety, Type A behavior pattern and poor social support (Zeman et al., 2002). According to the health behavior model, "anger out" produces poor physical health through lifestyle factors (Honkala & Al-Ansari, 2005).

The results emphasize the significance of anger as a determinant of hygiene behavior (Stahlnacke et al., 2003). Anger, contribute to cardiovascular disease via increased physiological responses to stressors (Bongard et al., 1998). Frequent episodes of anger create adverse neuroendocrine and cardiovascular responses (Pajer, 2007). The relation between anger regulation and adherence is recognized in studies. Adherence is critical to long term treatment success in children with chronic illness. Anger dimensions are link with full adherence to medical treatments (Leombruni et al., 2009). Therefore, anger regulation, whether internalized or externalized anger, determines physical wellbeing and psychological adjustment.

Researches support that training for control anger led to decrease negative consequences of anger (Sukhodolsky et al., 2005). The most popular intervention for anger regulation is cognitive-Behavior therapy (CBT). Cognitive-Behavior therapy is combined of different techniques such as relaxation, problem solving, cognitive restructure, imaginary, and role play for control behaviors (Sukhodolsky et al., 2004). Usually therapists apply these techniques in several stages. For example, in the first stage children identify environmental cues can onset of anger response. In the second stage, they replace self-conversation (such as I can handle it) instead of aggressive response. The next stage allocated to relaxation. Then they do role play for control anger in provoked anger situation. These kinds of programs have limitation for pediatrics service. By way of illustration, usual treatments concentrate on anger out and ignore anger in. In addition, they are not suitable for health care. Anger provoking situations in hospitals or other health care services are completely different

from situation in natural life. Moreover, these techniques are not attractive for children. In the final, CBT takes a lot of time and not appropriate for hospital conditions. The aim of this study was introduce new psychological methods for control anger in health care services. For this reason, we relied on butterfly effect philosophy. If changes occur with one element, changes will be induced along the entire system and reflected in each element (McMahon et al., 2007). Butterfly effect refer to the notion that a single flapping wing from a minute insect can create small changes in the atmosphere, which can impact weather conditions across the world. Small changes in the initial condition of the system can lead to a chain of events that will produce large scale alterations to the system (Lorenz, 1993). Cognitive strategies as the example distraction and education and externalized the anger in correct way could prevent of medical and psychological consequences of anger. We expected these strategies that are simple and attractive for children would display prominent outcome.

2. Methods

2.1. Participants

Forty-six children with cancer (girls=17, boys=29) and thirty-two children with TS (girls=12, boys=20) were recruited from major children's hospital in Tehran. A group thirty-five of healthy school children (girls=14 and boys=21) were recruited randomly from four schools (two public, two private) in the same geographic area with children who were in the hospital. Participants were being screened base on their parents or caregivers agreement to take part in the present experiment. Children were eligible to participate in the program if their age were between 8 to 15 years old and more than 6 month from diagnosis. All the children completed the program with no dropouts from either the intervention or control groups, so both pre- and post-test data for the one month that study were available. Subjects were assigned to the intervention in the three groups, cancer, TS and healthy groups. Cancer group and TS underwent intervention for anger control.

2.2. Procedure

After determination of participants, the intervention program was being performed. The control group concludes healthy children received no intervention. The program was running in 6 stages:

1. Assessment in the baseline: all participants (intervention and control) were evaluated in the Anger style expression by the questionnaires of study such as Anger Expression and Disruptive behaviors.

2. Education: intervention groups were taught about their illness and how illness damage to their body. Additionally, they learned care givers, doctors and regular treatments how try to reduce harm.

3. Drawing the target of anger: participants (intervention groups) were encouraged to clarify and drawing object of their anger, then alter pictures from a harmful to laughing.

4. Play computer game: Trigger Twist as a part of Collection of Wii Play Motion (2011) that is a cartoon game for children were being applied to intervention. Trigger Twist was a shooting gallery game that lets child point the remote around the room in any direction to aim at bad guys approaching him from all sides. This game helped the participants mentally and physically attack to enemy. The assumption of study was opportunity to distinguish real enemy and overcome to it as control anger strategy. This stage lasted for ten days.

5. Retest: Immediately, after end of intervention program, retest was carried out among three groups.

6. Confirming the retest: after one month as follow up, retest was repeated. Table 2 to 5 display results of changing the anger regulation before and after intervention.

2.3. Measures

2.3.1. The Anger Expression Scale for Children (AESC) is a 30-item questionnaire that was developed using items from existing anger expression scales. The AESC is paper-and-pencil measure that utilizes a four-point Likert response format (almost never, sometimes, often, and almost always) with higher values keyed to greater endorsement of the items. Items for the AESC were generated by the fourth author (S.P.) in collaboration with group of pediatric psychologists and psychology trainees. Measurement invariance was established across groups using a series of nested tests. Correlations between AESC subscales and parent- and child-reported indices of anger, hostility, and aggression support the convergent validity of the scales. Cronbach's α were calculated Trait Anger $\alpha=0.84$; Anger Expression $\alpha=0.69$, Anger In $\alpha=0.71$; and Anger Control $\alpha=0.79$. Alpha coefficients for the four subscales across illness groups are as follows: Trait Anger $\alpha=84/.82$ (healthy/cancer); Anger Expression $\alpha=68/.71$; Anger In $\alpha=0.74/.63$; and Anger Control $\alpha=0.74/.86$. The Trait Anger subscale demonstrated the highest test-retest stability across both the 6- and 12-month intervals, which is consistent with expectations, although all subscales showed moderate and statistically significant consistency over time. "I get in a bad mood easily", "I hit things or people", "I keep it to myself", "I try to control my angry feelings" are the samples of scales (Phipps & Steele, 2009).

2.3.2. The Children's Inventory of Anger is a 40-item child self-report rated from 1 (no anger) to 4 (extreme anger). Children are asked to evaluate their response to potentially provoking events (eg, "someone cuts in

front of you in a lunch line’’). Although the Children’s Inventory of Anger has not been used in studies of parent management training, it has demonstrated sensitivity to change in psychosocial interventions with children (Sukhodolsky et al., 2005).

2.3.3. The Disruptive Behavior Rating Scale is an eight-item parent-rated scale keyed to the DSM-IV criteria for oppositional defiant disorder. Examples of relevant items on this scale include loses temper, argues with adults, actively defies adult requests, is touchy or easily annoyed, and is angry and resentful. The scale asks the parent to rate each item using a 4-point response format, where 0 never or rarely, 1 sometimes, 2 often, and 3 very often. Scores of 12 and higher are considered clinically significant. This scale was selected because it is sensitive to change with treatment and has been used in other clinical studies (Barkley, 1997).

3. Results

The demographic and medical background of the participants is presented in Table 1. The groups did not differ significantly in mean age.

Differences in the anger expression and disruption behaviors measures between two subgroups of chronically ill and healthy children before and after intervention were explored. There were statistically significant differences among three groups of cancer, TS and healthy groups on measures of anger expression subscales and disruption behaviors in the baseline of experience (table 2). Other words, table 2 show that in the time 1 or baseline: trait Anger, ($F=8.3$, $P<0.001$); Anger expression, ($F=12.34$, $P<0.001$); Anger in, ($F=10.56$, $P<0.001$); Anger control, ($F=21.18$, $P<0.001$); The Children’s Inventory of Anger, ($F=46.2$, $P<0.05$); The Disruptive Behavior Rating Scale, ($F=7.2$, $P<0.001$).

Participants were assessed after education about nature of illness, drawing intervention and aggressive computer game. Consequently these data were combined into a single table (table 3). There were no statistically significant differences, nor trends toward differences between children with control group, cancer and TS groups on measures of anger except expression in trait Anger and Children’s Inventory of Anger measures. In the other words, in the

time 2 or after intervention, The difference between the groups was as follows, trait Anger, ($F=7.9$, $P<0.05$) Anger expression, ($F=5.2$, $P>0.05$) Anger in, ($F=3.6$, $P>0.05$) Anger control, ($F=3.7$, $P>0.05$) The Children’s Inventory of Anger, ($F=36.8$, $P<0.05$) The Disruptive Behavior Rating Scale, ($F=.03$, $P>0.05$). In the time 3 or follow up stage the results repeated as following: trait Anger, ($F=7.4$, $P<0.05$) Anger expression, ($F=5.7$, $P>0.05$) Anger in, ($F=2.9$, $P>0.05$) Anger control, ($F=3.2$, $P>0.05$) The Children’s Inventory of Anger, ($F=32.3$, $P<0.05$) The Disruptive Behavior Rating Scale, ($F=.64$, $P>0.05$).

In the baseline post hoc tests revealed that cancer group gain a lower scores in trait Anger, Anger expression, Anger in Anger control, The Children’s Inventory of Anger ($p < .0001$), and The Disruptive Behavior Rating Scale and TS ($p < .0001$) groups obtained significantly higher scores in the all scales and subscales of Anger expression and disruptive behaviors than the healthy control group. After intervention, results of post hoc revealed significant difference between children with cancer and healthy group in trait of anger ($p<0.05$), and children with TS were differ with controls in The Children’s Inventory of Anger ($p<0.05$). but there is no difference in the other scale and subscales.

The healthy group did not score significantly different on the baseline and evaluation in the time 2 in all scores trait Anger, ($t=1.4$, $P>0.05$); Anger expression, ($t=0.78$, $P>0.05$); Anger in, ($t=0.002$, $P>0.05$); Anger control, ($t=5.6$, $P>0.05$); The Children’s Inventory of Anger, ($t=3.8$, $P>0.05$); The Disruptive Behavior Rating Scale, ($t=0.006$, $P>0.05$). In contrast, Cancer and TS groups displayed significantly difference in the all scores: trait Anger, ($t=4.6$, $P<0.05$); Anger expression, ($t=6.4$, $P<0.001$); Anger in, ($t=5.2$, $P<0.05$); Anger control, ($t=5.8$, $P<0.001$); The Children’s Inventory of Anger, ($t=12.6$, $P<0.05$); The Disruptive Behavior Rating Scale, ($t=0.8$, $P<0.05$) and in the TS group scores were as following trait Anger, ($t=6.4$, $P<0.001$); Anger expression, ($t=3.9$, $P<0.05$); Anger in, ($t=4.3$, $P<0.05$); Anger control, ($t=6.1$, $P<0.001$); The Children’s Inventory of Anger, ($t=13.4$, $P<0.05$); The Disruptive Behavior Rating Scale, ($t=2.7$, $P<0.001$) (table 5).

Table 1. General characteristics of the study sample

	Cancer group (%)	TS group	Healthy group
Age	Mean:8.7	Mean: 9.3	Mean:9.1
Sex:			
Girls	36.96	37.5	40
boys	63.04	62.5	60
Duration of disease	Mean: 3.4 years	Mean:-	-
Duration of hospital stay	Mean: 2 weeks	Mean: 1 week	-
Residency:			
Tehran	41.3%	54%	100%
Other cities	58.70%	46%	

Table 2. Group differences on Anger expression and Disruptive behaviors in Baseline

T ₁							
Variables	Healthy group		Cancer group		TS group		F
	M	SD	M	SD	M	SD	
Tr A	18.2	7.3	14.5	4.1	28.19	4.6	8.3**
A ex	16.3	3.6	10.1	2.4	21.32	2.7	12.34**
A in	7.2	2.1	12.4	1.8	5.84	2.5	10.56**
A con	19.76	4.3	16.43	3.9	8.46	4.4	21.18**
CHiA	76.38	26.31	67.43	23.4	94.56	19.8	46.2*
DBR	8.6	2.2	7.8	2.4	16.5	3.6	7.2**

T₁=time 1 or baseline of assessment, Tr A=trait Anger, A ex=Anger expression, A in= Anger in A con= Anger control, CHiA= The Children's Inventory of Anger, and DBR= The Disruptive Behavior Rating Scale.

**P<0.001 *P<0.05

Table 3. Group differences on Anger expression and Disruptive behaviors after intervention

T ₂							
Variables	Health group		Cancer group		TS group		F
	M	SD	M	SD	M	SD	
Tr A	18.1	7.8	12.11	3.7	19.62	4.5	*7.9
A ex	16.9	3.4	18.42	2.3	17.3	3.4	5.2
A in	7.9	4.2	10.15	2.4	6.7	2.9	3.6
A con	19.23	5.6	18.12	2.9	17.9	3.8	3.7
CHiA	74.43	30.3	58.9	18.6	74.43	18.7	*36.8
DBR	9.1	5.2	7.8	2.1	8.3	3.4	.03

T₂=time 2 or after intervention

**P<0.001 *P<0.05

Table 4. Group differences on Anger expression and Disruptive behaviors 1 month after intervention

T ₃							
Variables	Health group		Cancer group		TS group		F
	M	SD	M	SD	M	SD	
Tr A	18.2	4.8	13.9	3.7	19.62	4.5	*7.4
A ex	17.2	2.4	17.8	2.3	17.3	3.4	5.7
A in	7.6	4.2	12.1	2.4	7.1	2.9	2.9
A con	20.01	5.6	18.6	2.9	17.4	3.8	3.2
CHiA	73.6	30.3	58.3	18.6	76.5	18.7	*32.3
DBR	9.3	5.2	5.7	2.1	8.2	3.4	.64

T₃=time 3 or 1 month after intervention

**P<0.001 *P<0.05

Table 5. Difference before and after experience in the three groups

Variables	health group			Cancer group			TS group		
	pre	post	t	pre	post	t	pre	post	t
Tr A	18.2	18.1	1.4	14.5	12.11	4.6*	28.19	19.62	6.4**
A ex	16.3	16.9	0.78	10.1	18.42	6.4**	21.32	17.3	3.9*
A in	7.2	7.9	0.002	12.4	10.15	5.2*	5.84	6.7	4.3*
A con	19.76	19.43	5.6	16.43	18.72	5.8**	8.46	17.9	6.1**
CHiA	76.38	74.43	3.8	67.43	58.91	12.6*	94.56	74.43	13.4**
DBR	8.6	9.1	0.006	7.8	5.4	0.8*	16.5	8.3	2.7**

**P<0.001 *P<0.05

4. Conclusion

This study was conducted to investigate the effects of computer game and drawing the anger goal as intervention strategies for anger regulation in children

with chronic illness. The result showed that participants after intervention were able to control their anger but despite improvement, they were no identical with health group in the all subscales.

Children's drawing usually is being used for assessing emotional conditions in the pediatrics field (Cox C, 1993). In present study, drawings helped to anger regulation. Participants drawn their anger goals; then by cognitive distraction (changing the picture from harmful to laughing object) regulate their anger. This technique helped participants to recognize anger objections.

Children in the intervention group showed greater reduction in disruptive behaviors after one month than controls. This result is in line with previous findings about using of technology as intervention for children that deal with health problems. For example, computer games apply to health education for children (Papastergiou, 2009). Moreover, computer games reduce unwanted, involuntary memory flashbacks of traumatic events (Holmes et al., 2009). To promote an increase in physical activity and change sedentary life style design modern computer games which links a player's daily foot step count to the growth and activity of an animated virtual character (Lin et al., 2006). Improvement of attention is another beneficial of computer games for children. For example, this technology was effective to improve deficit of eye gaze in children with Autism spectrum (Kane, 2011). Pediatrics strongly relate to nutrition. Nutrition issue, from anorexia as consequences of cancer to children's diabetic diet is the most serious concern for health services providers. Appetitive and aversive taste conditioning in a computer games through motivational properties can transfer to the real world (McCabe et al., 2009). For first time, we suggested in this study aggressive computer games for anger regulation. This technology specially is suitable for children with cancer, because they intend to internalize their anger.

Children are not able to express their anger by words. Indirectly expression of anger and learn to how control negative emotions lead to improve the quality of life in children with health problem.

One of the problems of children with chronic illness for anger regulation is they are not able to distinguish the goals of anger. They suppose that care resource (parents, practitioner or nurses) and harm resource (disease) are equal. In the first stage of study, participants were taught how illness damage to their body. Aware of anger source change anger direction from treatment to illness. In the second stage participant are guided to externalize their anger. Mentally attack to the illness reinforced fighting spirit in the participants. Fighting spirit not only increase adjustment to illness but also interferes in procedure of growing illness (Migliorini & Tonge, 2009). Many of study demonstrated outward and inward anger and lack of anger control would be associated with delayed healing. Individuals exhibiting lower levels of anger control were more likely to be categorized as slow

healers (Coyle et al., 2007). For this reason, we expect our participants would be display level of improvement in their wellbeing.

Catharsis theory suggested if people do not let their anger out but try to keep it bottled up inside, it will eventually cause them to explode in an aggressive rage. However, Catharsis is seen as a way of relieving the pressure and reducing anger (Bushman et al., 2001). Computer game allowed the participants to direct their anger outward. This explanation works for children with cancer as repressors. For children with TS there is different explain. They usually experience much more anger. Opportunity to externalize the anger acts as paradoxical technique. Paradox makes the aggressive behaviors meaningless (Seltzer, 1986).

Anger control probably effects on physical and psychological wellbeing through the other variables. For example, conscious of anger and appropriate expression could improve relationship with other people. Friendly behaviors increase social support and better adherence to medical cares. In addition, children encourage doing health behaviors because they found out they should fight to illness.

Furthermore, a computer game implements other psychological interventions such as Cognitive and Behavioral Therapies. It helps to create a context in which children could engage more easily with the therapeutic process and with the clinician.

Technology can help to provide a structure around which clinicians can tailor interventions to best suit the needs of their clients. For instance, computer games attract children's cooperation for treatment process by fascinating, tangibility and flexibility of this technique. Present research concluded an implication for manufacturers of computer games. It is necessary to be design computer games that are suitable for improvement of emotions regulation, cognitive deficits and problematic behaviors.

Lack of computer games for treatment and anger regulation was the biggest limitation for this study. For future studies are being suggested a comparison among children with chronic illness for anger expression and response to anger regulation programs.

Corresponding Author

Manijeh Firoozi

Department of psychology & Education, University of Tehran, Tehran

E-mail: manijeh_firoozi@hotmail.com

Tel: +982122959635

5. References

1. Jacobs, GA, Kronaizl C. Pediatric anger in rural impoverished communities. Paper presented at the annual meeting of the American Psychological Association. 1991, San Francisco, CA.

2. Phipps S, Steele R. Repressive Adaptive Style in Children with Chronic Illness. *Psychosomatic Medicine* 2002; 64: 34-42.
3. Hauber RP, Rice MH, Howell CC, Carmon M. Anger and blood pressure readings in children. *Applied Nursing Research* 1998; 11: 2-11.
4. Penedo FJ, Dahn JR, Kinsinger D, Antoni MH, Molton I, Gonzalez JS, et al. Anger suppression mediates the relationship between optimism and natural killer cell cytotoxicity in men treated for localized prostate cancer. *Journal of Psychosomatic Medicine* 2006; 60:423-7.
5. Sukhodolsky DG, Scahill L, Zhang H, et al. Disruptive behavior in children with Tourette's syndrome: Association with ADHD comorbidity, tic severity, and functional impairment. *J Am Acad Child Adolesc Psychiatry* 2003; 42: 98-105.
6. Sukhodolsky DG, Leckman JF, Rothenberger A, Scahill L. The role of abnormal neural oscillations in the pathophysiology of co-occurring Tourette syndrome and attention deficit/hyperactivity disorder. *Eur Child Adolesc Psychiatry* 2007; 16: 51-9.
7. Fraguas R, Iosifescu DV, Bankier B, Perlis R, Clementi Craven N, et al. depressive disorder with anger attacks and cardiovascular risk factors. *Int J Psychiatry Med* 2007; 37: 99-111.
8. Zeman J, Shipman K, Suveg C. Anger and Sadness Regulation: Predictions to Internalizing and Externalizing Symptoms in Children. *Journal of Clinical Child and Adolescent Psychology* 2002; 31(3): 393-8.
9. Honkala S, Al-Ansari J. Self-reported oral health oral hygiene habits and dental attendance of pregnant women in Kuwait. *J Clin Periodontol* 2005; 32: 809-14.
10. Stahlacke K, Soderfeldt B, Unell L, Halling A, Axtelius B. Perceived oral health changes over 5 years in one Swedish age-cohort. *Community Dent Oral Epidemiol*, 2003; 31: 292-9.
11. Bongard S, Absi M, Lovallo WR. Interactive effects of trait hostility and anger expression on cardiovascular reactivity in young men. *International Journal of psychophysiology* 1998; 28: 181-91.
12. Pajer KA. Cardiovascular disease risk factors in adolescents: do negative emotions and hypothalamic-pituitary-adrenal axis function play a role? *Curr Opin Pediatr* 2007; 19: 559-64.
13. Leombruni P, Fassino S, Lavagnino L, Orofino G, Morosini P, Picardi A. The Role of Anger in Adherence to Highly Active Antiretroviral Treatment in Patients Infected with HIV. *Psychother Psychosom* 2009; 78: 254-7.
14. Sukhodolsky DG, Golub A, Stone EC, Orban L: Dismantling anger control training for children: A randomized pilot study of social problem-solving versus social skills training components. *Behav Ther* 2005; 36: 15-23.
15. Sukhodolsky DJ, Kassinove H, Gorman BS. Cognitive-behavioral therapy for anger in children and adolescents: a meta-analysis. *Aggression and Violent Behavior* 2004; 9 (3): 247-69.
16. McMahon M, Hadfield M, Hadfield M. 'The Butterfly Effect' Creative Sustainable Design Solutions through Systems Thinking. *American Psychologist* 2007; 50: 106-7.
17. Lorenz EN. *The essence of chaos*. Seattle, WA: University of Washington Press. 1993.
18. Phipps S, Steele RG. Development of an anger expression scale for children and its' relationship to the construct of adaptive style. *Journal of Pediatric Psychology* 2009; 34(1): 51-62.
19. Sukhodolsky DG, Golub A, Stone EC, Orban L. Dismantling anger control training for children: A randomized pilot study of social problem-solving versus social skills training components. *Behav Ther* 2005; 36:15-23.
20. Barkley RA. *Defiant Children: A Clinician's Manual for Assessment and Parent Training*, 2nd ed. New York, Guilford Press, 1997.
21. Cox C. The volcano drawing: A technique for assessing levels of affective tension *Cassette Recording* 1993; 34: 16-143.
22. Papastergiou M. Exploring the potential of computer and video games for health and physical education: A literature review. *Computers & Education* 2009; 53: 603-22.
23. Holmes EA, James EL, Coode-Bate T, Deerprouse C. Can Playing the Computer Game "Tetris" Reduce the Build-Up of Flashbacks for Trauma? A Proposal from Cognitive Science. *PLoS ONE* 2009; 4(1): 41-53.
24. Lin JJ, Mamykina L, Lindtner S, Delajoux G, Strub HB. Fish'n'Steps: Encouraging Physical Activity with an Interactive Computer Game. *UbiComp* 2006, 42(06): 261-78.
25. Kane JL. *Exploration of Computer Game Interventions in Improving Gaze Following behavior in Children with Autism Spectrum Disorders*. Thesis submitted to the faculty of the Virginia Polytechnic Institute and State University, 2011.
26. McCabe JA, Tobler PN, Schultz W, Dickinson A, Lupson V, Fletcher PC. Appetitive and Aversive Taste Conditioning in a Computer Game Influences Real-World Decision Making and Subsequent Activation in Insular Cortex. *The Journal of Neuroscience* 2009; 29(4):1046-51.
27. Migliorini C, Tonge B. Reflecting on subjective wellbeing and spinal cord injury. *J Rehabil Med* 2009; 41: 445-50.
28. Coyle D, Doherty G, Matthews M, Sharry J. *Computers in Talk-Based Mental Health Interventions*. *Interacting with Computers* 2007; 19(4): 545-62.
29. Bushman BJ, Baumeister RF, Phillips CM. Do people aggress to improve their mood? Catharsis beliefs, affect regulation opportunity, and aggressive responding. *Journal of Personality and Social Psychology* 2001; 81:17-32.
30. Seltzer LF. *Paradoxical strategies in psychotherapy: A comprehensive overview and guidebook*. Wiley series on personality processes. Oxford, England: John Wiley & Sons. 1986. 323.

1/11/2013