12 - PERFORMANCE TRANSFER FROM REAL ENVIRONMENT TO VIRTUAL IN THE PHYSICALLY DISABLED

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INTRODUCTION:

Modernization, industrialization and information today makes man, despite having a very eventful life, use less and less physical effort (walking, cycling, swimming, manual labor, etc) in order to attain the goals of everyday life. Technology has facilitated the lives of individuals in their hardest tasks. While on the one hand this is very good, on the other, technology has allowed man to become more sedentary and consequently more exposed to chronic-degenerative diseases and obesity, among others (ZUCHETTOE & CASTRO, 2002).

In the treatment of people with disabilities, the practice of physical activity is of fundamental importance, emphasizing activities that take into account their capacity, needs and limitations, aiding in the development and improvement of movements required to perform essential tasks in their daily lives. Physical activities, in addition to the organic benefits (metabolic, cardiorespiratory and muscle-osteoarticular aspects), contribute significantly to the improvement of social interaction, promoting independence, a more positive self concept, thus, causing the physically disabled to be encouraged to do what they are capable, seeking to optimize their potential. It is known that people with disabilities tend to be more sedentary, therefore, the social support of family and friends is considered fundamental for them to adopt a more active lifestyle. When well guided, physical activity allows an improvement in the quality of life of the physically disabled (ZUCHETTOE & CASTRO, 2002).

The concept of quality of life is highly complex and involves dimensions as physical, family and emotional well-being, functional ability, spirituality, social function, sexuality and occupational function that when integrated maintains the individual in balance with themselves and with the world around them. According to the World Health Organization, the quality of life is the perception of the individual about their position in life according to the cultural context and the system of values with which coexists in relation to their goals, expectations, standards and concerns (WHOQOL GROUP, 1995; VECCHIA et al., 2005; MINAYO et al., 2000).

Considering the importance of the practice of physical activity for the quality of life of the physically disabled, one option among several possibilities is the practice of adapted sports, including competitive sports. Competitive sports for the physically disabled have became more known after the emergence of the Paralympic Games for people with disabilities, which happens at the same time and place of the already traditional Olympic Games (ZUCHETTOE & CASTRO, 2002).

Among the considered Paralympic sports, a sport quite interesting for the physically disabled, mainly by requiring little adaptation of rules, is adapted table tennis, which can be played by the physically disabled in the categories male and female, for team and individual, practiced on foot or with the use of wheelchair (FREITAS & CIDADE, 2000). Curious is that besides the practice of traditional table tennis with adaptations for the physically disabled, there is currently a highly-commented and practiced differentiated version which uses virtual electronic games, among several, the Nintendo Wii console is probably the most cited in the literature (SAPOSNIK et al., 2010, BAUMEISTER et al., 2010, FOLEY et al., 2010). The overture of this game ratified, above all, the idea of a simple and fun apparatus that interests children as much as parents, making the console a space of sociability through the sharing of a bodily experience. It is interesting to observe that discussions on the innovative character of interactivity with the user of the Nintendo Wii, i.e. corporal use of its processes to take advantage of the possibilities given by this console, is within a perspective of special attention to studies on the body in the humanities and social sciences, which in a way recognizes the importance of bodily aspects for the use of communication (NEWBON, 2006).

The practice of table tennis, both in real and virtual environments, have some noted similarities, independent of the environment, as movement skills that have specialized characteristics in reference to the task and constitute mature exercises of refined fundamental movements (GALLAHUE, 2005). Thus, the point upon where such skills are developed depends on a combination of specific conditions of the requirements of the task; the biology of the individual and the conditions of the learning environment.

After the observations presented, the analysis is quite interesting of the performance of adapted table tennis athletes within a context of executing tasks in a virtual environment, where the results could direct future research on the transfer of similar tasks between real and virtual environments. For both, emerged the following question: will the adapted table tennis practitioner be able to transfer their performance when faced with the same sport, however, in a virtual environment?

OBJECTIVE:

The aim of this study was to verify whether there is performance transfer on a task performed in a real-world environment to a virtual gaming environment in individuals with physical disabilities.

METHOD:

Participating in the study are 15 participant athletes of adapted table tennis inexperienced in the task of playing table tennis on Nintendo's Wii Sport Resort, being 10 males and 5 females (Table1) who participated in the III PARALYMPIC "SPORTS TALENT" PAULISTA RANKING CHAMPIONSHIP held in the year 2010. This study was approved by the committee of ethics in research with Protocol approval number PP 13501130 and all participants signing the Terms of Free and Informed Consent agreeing with participation in the study.

To execute the task, the table tennis game of Nintendo's Wii Sport Resort was used. To this end, the participants were approximately 9.5 feet away from a Sony brand, 52-inch television and performed the task of receiving the table tennis ball and returning it to the opponent ´s court. The design of the study consisted of performing 100 attempts, with 10 blocks of 10 attempts for each participant.

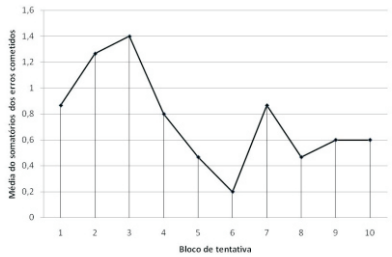
TABLE 1: characteristics of the participants of the study

ID	GÊNERO	IDADE	DEFICIÊNCIA	CLASSIFICAÇÃO FUNCIONAL
1	Masculino	48	Lesão medular T7	3
2	Masculino	30	Lesão medular T1	3
3	Masculino	39	Lesão medular T12	4
4	Masculino	40	Lesão medular C6, C7	2
5	Feminino	20	Lesão medular T9	4
6	Feminino	12	Mielo - cadeirante	5
7	Masculino	22	Lesão medular L2, L3	3
8	Masculino	43	Lesão medular T10	4
9	Feminino	38	Poliomelite - cadeirante	4
10	Masculino	15	Mielo - cadeirante	5
11	Masculino	14	AVE esquerdo – em pé	7
12	Feminino	39	Poliomelite - cadeirante	4
13	Masculino	19	Hemiparesia direita – em pé	8
14	Masculino	44	Lesão medular T11, T12	4
15	Feminino	40	Poliomielite - cadeirante	5

RESULTS:

The initial data for each error that the participants committed were recorded on a spreadsheet, later organized into blocks of 10 attempts, and the sum of the errors in each block was made. A two-factor (group1 X bloco10) non-parametric distribution using analysis of variance (ANOVA) was executed using repeated measures of the last factor. Due to the violation of the assumption of sphericity (compound symmetry) of covariance matrices, the value of F was corrected by Greenhouse-Geisser method. The statistical test indicated that there were no significant differences in fixed "block" factor [$F(9.13) = 1.35$; $p > 0.05$; $\eta 2 = 0.88$]. Accordingly, participants presented similar performances in each block of 10 attempts.

GRAPH 1: Mean sum of errors made by participants in each block of 10 attempts.



DISCUSSION:

The quality of life of the physically disabled is characterized by progressive accumulation of incapacities in the functional activities of their daily living, associated with adverse socioeconomic conditions. The various professionals and all the promotional initiatives of health, healthcare and health rehabilitation must have as a goal to enhance, maintain or recover the individual's functional capacity, enhance the autonomy and physical and mental independence (ANDRADE, 2001, ERICSSON et al., 1993). We can define as functional capacity the ability to maintain the physical and mental skills necessary for an independent and autonomic life (MOTA, 2006; MORAES, 2007).

Knowing the importance of the practice of physical activity and sport for motor and cognitive development of any human being, it is fundamental to create initiatives that verify the possibility of participation of people with disabilities in adapted sports practices. GORGATTI and GORGATTI (2008) define adapted sport as a sport modified or especially created to meet the unique needs of individuals with some type of disability.

The practice of table tennis as a Paralympic sport has precisely the function of providing multiple benefits to the disabled, with the development and improvement of self-image, stimulus to independence, social interaction, experiences of success and failure, stimulus functions from the trunk and upper limbs, and physical skills development, etc. (FREITAS & CIDADE, 2000). Another possibility for individuals with disabilities is the practice of sports through video game consoles, which are being investigated as an adapted form to encourage physical activity and experience similar movement to different sports. It is important to emphasize that the use of electronic games becomes increasingly used in the daily life of the individual, including the targeting of studies through the use of video games is quite diverse and covers different areas such as the identification of energy expenditure (FOLEY et al., 2010), development of motor skills in industrial training and surgical training in medicine (BOKHARI et al., 2010) and studies with different disabilities (CAMEIRÃO et al., 2010). However, studies that compare the performance in real adapted sport with its version in the virtual environment were not found in the literature.

In this study, the results indicated that the performance among the participants was good to accomplish the task in the virtual environment. The overall effect size ($\eta 2 = 0.88$) showed that approximately 88% of the variation of errors made by practicing table tennis in Nintendo Wii indicates few errors in the execution of the task. This good performance can be credited to the experience that athletes have in the practice of table tennis in the real environment.

A justification for the result can be in existence of an increase in extrinsic factors in the tasks performed in the real

environment and as such, the performance of a similar task in the virtual environment is easier. BAUMEISTER et al. (2010) performed a comparison between the real and virtual environment considering cortical areas and found that in the real environment activities required greater attention and neural activity when undertaken in the virtual environment.

Another factor to consider is the ease of the task chosen for the job: In the daily training of the adapted table tennis athlete, the task execution in the real environment becomes a routine that is enhanced considering standards, style variations and developing greater skill in precision, accuracy, coordination and motor control (GALLAHUE, 2005), even without having experience in the virtual environment, as characteristics of the virtual task were easy. The adequate performance of a task depends on the improvement in performance based on better physical competence that can be observed from one moment to another, due mainly to the individual ´s improvement of muscle strength, endurance, reaction time, the speed of movement, coordination, and so on (GALLAHUE, 2005). This improvement is not necessary when the task is relatively easy for the individual, leading to the perfection of executions since the first moment.

RAND et al. (2004) mention that technological advances continue to influence regular sport practices and emphasize that occasionally there are created new tools for intervention. The use of video games as an instrument of intervention in the practice of physical activity is one of these new tools, where the changes, if directed for a differentiated participation in different sports, is an innovative practice that allows inclusion and participation of individuals with various disabilities (RIZZO 2002). This experience is also with the appreciation of the usage of the body in interactive digital media processes, as these require a proactive posture for the exploration of the environment by its user, which is performed by the physical senses (MORROW et al., 2006).

We can conclude that the Nintendo Wii is a technology that fits within this current trend of the appreciation of the body in the processes of interaction, but, unlike other consoles, had a great impact for having invested in the idea of a "more effective" physical interaction, besides the need given by the console for group participation within a collective (MORROW et al., 2006; NEWBON, 2006). Therefore, to achieve greater knowledge about the relationship of performance on the task performed in real and virtual environments, the need for more research that compares the tasks of these two environments is apparent.

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PERFORMANCE TRANSFER FROM REAL ENVIRONMENT TO VIRTUAL IN THE PHYSICALLY DISABLED

ABSTRACT

The aim of this study was to verify whether there is performance transfer on a task performed in a real environment to a virtual gaming environment in individuals with physical disabilities. Participating in the study are 15 participant athletes of adapted table tennis inexperienced in the task of playing table tennis on Nintendo's Wii Sport Resort. The task was to receive the table tennis ball and return it to the opponent ´s court in the table tennis game of Nintendo's Wii Sport Resort. The design of the study consisted of performing 100 attempts, with 10 blocks of 10 attempts for each participant. The results indicated that participants presented similar performance in each block and attempts, representing that there was performance transfer in the real environment to the virtual environment. Attributing to this result is the fact that the task of table tennis in the real environment presents greater difficulties, mainly in the increase of extrinsic factors, and thus, performing in a virtual environment is easier. Accordingly, it was concluded that the Nintendo Wii is a technology that falls within the current trend of body appreciation in the processes of interaction, noting the need for more research that compares these tasks in real and virtual environments.

KEYWORDS: Environment Controlled, Disabled Persons, Motor Activity

TRANSFÉRENCE DE PERFORMANCE DANS UNE ENVIRONNEMENT RÉEL POUR UM ENVIRONNEMENT DE JEU VIRTUEL AVEC DES INDIVIDUÉS HANDICAPS

RESUME

Le but de la recherche était de vérifier s'il se produit un transfert de performance entre une tâche réalisée en environnement réel et un environnement de jeu virtuel, pour des individus handicapés. Quinze joueurs de tennis de table handi-sport qui n'avaient jamais joué au tennis de table Wii Sport Resort de Nintendo ont participé à cette recherche. L'objectif était de recevoir puis renvoyer la balle de ping-pong dans le camp de l'adversaire au jeu de tennis de table Wii Sport Resort de Nintendo. Les limites de l'étude consistèrent en cent tentatives, réparties en dix séries de dix tentatives pour chaque participant. Les résultats indiquèrent que les participants montrèrent des progrès similaires dans chaque groupe de tentatives, ce qui signifie qu'il y a eu transfert de performance d'un environnement réel à un environnement virtuel. Il s'attribua ce résultat au fait que la tâche de jouer au tennis de table dans un environnement réel présent plus grande difficulté, principalement, par l'augmentation de facteurs extrinsèques, et de cette façon plus facile de la réaliser dans un environnement virtuel. Ainsi, se conclut que le Nintendo Wii est une technologie que s'insère à la tendance actuelle de plus de valorisation du corps aux procès de interaction, en étant notoire le besoin de plus de recherche que comparent des tâches d'environnement réel e virtuel.

MOTS-CLÉS: contrôle technologique de environnement, handicaps, activités motrices.

CAMBIO DE RENDIMIENTO EN EL AMBIENTE REAL PARA VIRTUAL POR MINUSVÁLIDOS FÍSICOS

RESUMEN

El objetivo de esta investigación fue averiguar si hay cambio de los resultados en una tarea que se realiza en ambiente real para un ambiente de juego virtual por las personas minusválidas fisicamente. Participaron del estudio 15 atletas jugadores de tenis de mesa adaptado, sin experiencia en la tarea de practicar el deporte en Wii Sports Resort de Nintendo. La tarea fue recibir la pelota de tenis de mesa y devolverla en la cancha rival de nuevo en el juego de tenis de mesa en Wii Sports Resort de Nintendo. El plano de estudio consistió en 100 intentos, en 10 etapas de 10 jugadas para cada participante. Los resultados indicaron que los participantes alcanzaron actuaciones similares en cada fase y intentos, lo que representa que hay un cambio de resultados de ambiente real para ambiente virtual. Esa observación se atribuyó al hecho de que la tarea de tenis de mesa en el ambiente real sea más difícil, principalmente por el aumento de los factores extrínsecos; así, la tarea en un ambiente virtual es más fácil. Por lo tanto, Wii de Nintendo es una tecnología que se ajusta a la tendencia actual de la valoración del cuerpo en el proceso de interacción, pero es evidente la necesidad de más investigación que compare la tarea de estos ambientes reales y virtuales.

PALABRAS CLAVE: control tecnológico de Ambiente, minusválido físico, actividad motora

TRANSFERÊNCIA DE DESEMPENHO DE AMBIENTE REAL PARA VIRTUAL EM DEFICIENTES FÍSICOS

RESUMO

O objetivo da presente pesquisa foi verificar se existe transferência de desempenho em uma tarefa realizada no ambiente real para um ambiente de jogo virtual em indivíduos com deficiência física. Participaram da pesquisa 15 atletas praticantes de tênis de mesa adaptado inexperientes na tarefa de jogar tênis de mesa no Wii Sport Resort da Nintendo. A tarefa consistiu em receber a bola de tênis de mesa e devolver no campo adversário no jogo de tênis de mesa do Wii Sport Resort da Nintendo. O delineamento do estudo consistiu na realização de 100 tentativas, sendo 10 blocos de 10 tentativas para cada participante. Os resultados indicaram que os participantes apresentaram desempenhos semelhantes em cada bloco e tentativas, o que representa que houve transferência de desempenho de ambiente real para ambiente virtual. Atribuiu-se esse resultado ao fato de que a tarefa de tênis de mesa em ambiente real apresenta maior dificuldade, principalmente, pelo aumento de fatores extrínsecos, e desta forma realizá-la em ambiente virtual seja mais fácil. Assim, concluiu-se que o Nintendo Wii é uma tecnologia que se insere na tendência atual de valorização do corpo nos processos de interação sendo notória a necessidade de mais pesquisas que comparem tarefas destes do ambiente real e do virtual.

PALAVRAS-CHAVE: Controle Tecnológico de Ambientes, Pessoas com Deficiência, atividade motora