UNIVERSIDADE FEDERAL DE MINAS GERAIS
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da Criança e do Adolescente

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STUDY OF AUDITORY AND VISUAL SENSORY RESPONSES IN INFANTS AGED 6 TO 15 MONTHS WITH AND WITHOUT BACK AND FOOT SUPPORT

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Study of auditory and visual sensory responses in infants aged 6 to 15 months with and without back and foot support

Estudo das respostas sensoriais auditiva e visual em lactentes de 6 a 15 meses com e sem apoio dorsal e plantar

Tese apresentada ao Programa de Pós-graduação em Ciências da Saúde - Saúde da criança e do adolescente da Universidade Federal de Minas Gerais, como requisito parcial à obtenção do título de doutor Ciências da Saúde.

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Orientadora: Profª. Dra. Erika Maria Parlato-Oliveira

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FOLHA DE APROVAÇÃO

STUDY OF AUDITORY AND VISUAL SENSORY RESPONSES IN INFANTS AGED 6 TO 15 MONTHS WITH AND WITHOUT BACK AND FOOT SUPPORT

ISABELLA MARQUES PEREIRA RAHME

Tese submetida à Banca Examinadora designada pelo Colegiado do Programa de Pós-Graduação em CIÊNCIAS DA SAÚDE - SAÚDE DA CRIANÇA E DO ADOLESCENTE, como requisito para obtenção do grau de Doutor em CIÊNCIAS DA SAÚDE - SAÚDE DA CRIANÇA E DO ADOLESCENTE, área de concentração em CIÊNCIAS DA SAÚDE.

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que adoçam meus ouvidos e meus olhos
diariamente.

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Isabella MP Rahme

"Por tudo, réis-coado, fico pensando. Gosto. Melhor, para a ideia se bem abrir, é viajando em trem-de-ferro. Pudesse, vivia para cima e para baixo, dentro dele. [...] Dor do corpo e dor da ideia marcam forte [...] Vai, mar... De sorte que, então, olhe: o Firmiano, por apelidado Piolho-de-Cobra, se lazarou com a perna desconforme engrossada, dessa doença que não se cura; e não enxergava quase mais, constante o branquiço nos olhos, das cataratas."

"Então êle sorriu, o pronto sincero, e me vale me respondeu:

-Tem cisma não. Pensa para diante. Comprar ou vender, às vêzes, são as ações que são as quase iguais...

E me cerro, aqui, mire e veja. Isto não é o de um relatar passagens de sua vida, em toda admiração. Conto o que fui e vi, no levantar do dia. Auroras.

Cerro. O senhor vê. Contei tudo. Agora estou aqui, quase barranqueiro. Para a velhice vou, com ordem e trabalho. Sei de mim? Cumpro. O Rio de São Francisco- que de grande se comparece-parece é um pau grosso, em pé, enorme.... [...] Existe é homem humano. Travessia."

Trechos da obra Grande Sertão: veredas,1964

João Guimarães Rosa

Resumo

Nesta tese, no capítulo 1 denominado de Considerações Iniciais, relatamos as publicações relevantes em torno do apoio dorsal e plantar, tema que foi abordado ao longo dessa tese em nossos escritos de artigos científicos. No capítulo 3 encontra-se o artigo original, em versão inglesa, adaptado para a publicação na International Archives of Otorhinolaryngology, ISSN 1809-4856 (versão online). Este artigo intitulado "Estudo das respostas sensoriais auditivas e visuais em lactentes de 6 a 15 meses com e sem apoio dorsal", teve por objetivo avaliar as respostas sensoriais auditivas e visuais em lactentes por meio de avaliações auditiva (Avaliação do Comportamento Auditivo) e visual (avaliação da acuidade visual com o uso do Lea Gratings), em duas situações, em ambos os testes: com e sem o apoio dorsal e plantar. O capítulo 4 é composto pelo artigo original, em versão inglesa, adaptado para a publicação na Revista Brasileira de Oftalmologia ISSN 1982-8551 (online version). Este artigo intitulado "Resposta de orientação e fixação visual a experimentos visuais em crianças: uso do apoio dorsal e plantar", teve por finalidade reportar a influência positiva do apoio dorsal e plantar na entrada sensorial visual durante testes visuais. Este artigo foi composto por 2 experimentos visuais com amostras diferentes. No experimento 1 utilizamos teste de detecção visual Lea Gratings em lactentes, enquanto no experimento 2, utilizamos o eye tracking em que investigamos a duração da fixação ocular em crianças com transtorno do espectro autista. Nos artigos científicos que foram descritos nos capítulos 3 e 4, quando utilizamos a situação apoio dorsal e plantar, tanto o dorso quanto os pés estavam apoiados e o contrário acontecia na situação sem apoio. No capítulo 5, descrevemos nosso projeto piloto que denominamos de fase 2 da pesquisa, intitulado "Looking at foot support in infant: Pilot ProjectA e Looking at back and foot support in adults: Pilot Projectb". Nesta fase, pesquisamos nos lactentes como seria a resposta visual e auditiva com uso do apoio dorsal e sem apoio plantar. Também nesta fase 2, pesquisamos como seria a resposta visual e auditiva em adultos com e sem apoio dorsal e plantar. No capítulo 6, apresentamos nas considerações finais, o enlace entre os temas que foram abordados ao longo desse manuscrito e os desdobramentos teóricos e clínicos. Os resultados desta tese serão apresentados ao Programa de Pós-Graduação em Ciências da Saúde, área de concentração em Saúde da Criança e do Adolescente para obtenção de título de Doutor em Ciências da Saúde da criança e do adolescente.

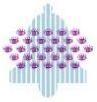
Palavras-chave: Percepção Visual. Percepção Auditiva. Desempenho Psicomotor. Lactente.

Abstract

In this thesis, in chapter 1 called Initial Considerations, we report the relevant publications around back and foot support, theme that was addressed throughout this thesis in our writings of scientific articles. In chapter 3 contains an original article adapted for publication in the International Archives of Otorhinolaryngology, ISSN 1809-4856 (online version). This article entitled "Study of auditory and visual sensory responses in infants aged 6 to 15 months with and without back and foot support" aimed to evaluate auditory and visual sensory responses in infants through auditory evaluations (Evaluation of the Auditory behavior) and visual behavior (evaluation of visual acuity with the use of Lea Gratings) in two situations in both tests: with and without back and foot support. In chapter 4 composed of the original article adapted for publication in the Brazilian Journal of Ophthalmology ISSN 1982-8551(online version) is written. This article entitled "Orientation and fixation visual response to visual experiments in children: use of back and foot support" was intended to report the positive influence of back and foot support in visual sensory input during visual tasks. This article was composed of two visual experiments with different samples. In experiment 1 we used visual detection test Lea Gratings in infants, while in experiment 2 we used eye tracking in which we investigated the duration of eye fixation in children with autism spectrum disorder. In the scientific articles that were described in Chapters 3 and 4, when we used the dorsal and foot support situation, both the back and feet were offered and the opposite occured (not offered) in the situation without support. In chapter 5 we described our pilot project that we call phase 2 of the research entitled "Looking at foot support in infant: Pilot ProjectA and Looking at back and foot support in adults: Pilot ProjectB". At this stage we researched in infants how would be the visual and auditory responses with back support and without foot support. Also in this phase 2, we researched how the visual and auditory responses would be in adults with and without back and foot support. In chapter 6 we presented in the final considerations the link between the themes addressed throughout this manuscript and theoretical and clinical developments. The results of this thesis will be presented to the PosGraduate Program in Health Sciences, a concentration area in Child and Adolescent Health to obtain a doctoral degree.

Keywords: Visual Perception. Auditory Perception. Psychomotor Performance. Infant.

SUMÁRIO



CHAPTER 1

INITIAL CONSIDERATIONS

CONSIDERAÇOES INICIAIS

The interaction between the organism and elements of the environment occurs since the intrauterine period. This interaction associated with variations in tone favor the baby's representation of movement. Researchers reported that when back support is offered to a infant/child, there is improvement in postural control of trunk and head and consequently the infant/child's attention time in relation to the environment increases (Bullinger, 2000; Pry et al., 2000). In addition to the back support studies, researchers studied and reported the positive effect of foot support. André Bullinger conceived sensorimotor development of the child as being deeply rooted in the many and complex interactions ocurring between sensory flows and deep-tonic sensations. Integration of these two components gives rise to a proprioceptive function, which he defined as a non-biological coordination that can be modified according to the interactions between the organism and its surroundings. The mutual integration can only occur in a context of active perception (Jouen et al., 2015). Gidley et als. suggested that one of the crucial steps for motor learning is the ability to form internal models, i.e., improve performance through errors and have the prediction of sensory consequences of motor commands (Gidley et al., 2008).

For the maintenance of body balance it is necessary that sensory inputs (visual, auditory, proprioception) are in arrangement with the motor system. Cherng et al., 2001 compared the influence of somatosensory input and sensory-visual input in a group of 20 children, 4 to 6 years of age, with developmental coordination disorder (CDD) compared to a control group matched by age and gender. Three types of visual inputs (eyes open, eyes closed and when the subjects wore a dome that partially blocked their vision and moved with head movement, the visual input was called sway-

referenced) and two types of input somatosensory (foot supported on a fixed platform and foot supported on a foam on the fixed platform) were varied factorfully to produce six sensory conditions. The results of this study suggest that the standing stability of children with CDD was significantly lower than that of control children in all sensory conditions, especially at the somatosensory input of foot supported by a foam on the fixed platform compared to foot supported on a fixed platform.

Al Abdulwahab and Kachanathu, 2015 hypothesized that small biomechanical changes in foot support can influence strategies to maintain postural balance. Therefore, the aim of this study was to investigate the role of various degrees of foot posture in static and dynamic components of foot balance in a healthy adult population. The research confirmed that there is a correlation between various degrees of foot posture in maintaining postural (standing) balance, particularly in the dynamic component.

Kornilova et al., 2004 realized an investigation of the oculomotor system after 7 days of dry immersion in individuals who were private and others who obtained afferent stimulation i.e.; foot support during dry immersion period. Dry immersion (DI) is one of the most widely used microgravity models in the soil. DI accurately reproduces the full spectrum of changes in body systems during exposure to microgravity as in short-term space flights (Tomilovskava et al., 2019). The aim of the study by Kornilova et al., 2004 was to determine the effects of proprioceptive, tactile and foot support afference on visual screening parameters and the meaning of foot support input for ocular function. The group of individuals without support stimulation exhibited marked omnidirectional deviations in the eye tracking

parameters throughout the experiment period. In the group of individuals who received foot support stimulus these parameters were little different from baseline values (visual screening function values tested before the experiment). Like Kornilova et al., 2004 another group of Russian researchers Zobova, Miller, Badakva, 2010 aimed to evaluate the effect of mechanical stimulation of foot support zones to mitigate the effects of lack of support load on postural muscles influencing saccade during prolonged deprivation of support (during 7 days of dry immersion). Data analysis showed that mechanical stimulation of foot support zones moderated significant alterations in ocular saccade kinematics.

Pereira and Parlato-Oliveira, 2015 evaluated children with autism spectrum disorder and children with typical development comparing the duration of eye fixation between groups with and without back and foot support using the *eye tracking.* As a result of the research, there was an increase in duration of eye fixation in both groups with back and foot support. These data are important for clinical practice with autistic people because any increase in fixation/visual screening is favorable, since one of the most prominent clinical features in autistic is decreased or absence of eye contact. They highlighted that the practice of back support can be used both in the clinic and in schools in children with normal development or with some disorder (Pereira and Parlato-Oliveira, 2015).

The research by Angsupaisal et al., 2017 was conducted with 19 children with unilateral or bilateral spastic cerebral palsy where children would be tested in the following situations: in the sitting position (on a stretcher with soft upholstery) and in the sitting position with 15º forward slope with and without foot support in both positions. An object range task (grabbing the object at its

own speed with the dominant hand) and the kinematics of head stability would be evaluated. The authors hypothesized that the immediate effect of foot support would head stability, that is, a smaller angular balance of head and a better quality in the task of reach. As postural instability during range is greater in children with bilateral spastic cerebral palsy than unilateral authors believed that children with bilateral spastic cerebral palsy would have better result with foot support. The study concluded that the position with inclination from 15º forward in the sitting position and the foot support do not affect the stability of the head. The task of reaching out in children with unilateral spastic CP obtained better results with forward inclination; in children with bilateral spastic CP prone forward worsens reach-effects are independent of foot support. Following this line of study previously described the same group of researchers Angsupaisal et al., 2019 continued the methodology adding simultaneously the surface electromyography of the neck, trunk and arm muscles and kinematics of the head and arm in order to evaluate the effect of tilting 15° forward in sitting position and foot support in children with CP in postural adjustments during a reach task. The study concluded that in terms of postural adjustments during the reach task with inclination from 15º forward, foot support increased children's ability to modulate the extensor activity of the trunk, which was associated with an improvement in the quality of the task of the reach.

Alkhateeb et al., 2019 developed a study on wheelchairs and back support with moderate to severe cerebral palsy patients who could not locomove. According to the authors, long periods in the wheelchair can affect alignment cephalic and cervical. The research aimed to examine the effect of back support on the wheelchair by adjusting the angles of postural alignment of the

head, neck and shoulders in people with cerebral palsy. They concluded that the back support in the wheelchair would provide a sagittal angle of head and neck more appropriate for this population. Kobara et al., 2015 investigated the influence of the difference in the position of the rotational axis of the back support in the vertical direction on the horizontal force applied to the buttocks to prevent decubitus ulcers in adult wheelchair users. As a result of the study, they suggested that the wheelchair should be able to adjust the height of the rotational axis of the backrest to reduce the horizontal force applied to the buttocks. They highlighted that the study shows one of the suggestions about the sit-down approach to the prevention of decubitus ulcers (Kobara et al., 2015).

The recommendations of back support and foot support were referenced during blood pressure (BP) measurement but are not always followed in clinical practice (Ringrose et al., 2017). Research conducted in the 1990s studied the effect of back support and stethoscope head on blood pressure determinations on the individual in the sitting position. Blood pressure measurements were performed in male adults with a history of hypertension in two situations: in a chair with back rest versus on an examination table without back rest and with a sino-diaphragmsin head in each condition. Systolic BP was not significantly different between the two situations, however diastolic BP (DBP) without back support was 6.5 mm Hg higher (P less than 0.0001) than DBP with back support (Cushman et al, 1990). A study conducted on adults by Ringrose et al., 2017 aimed to determine whether back and foot support would affect the mean measurements of oscillometric BP. The provision of back and foot support had a small effect on the mean oscillometric BP. The magnitude of the effect was higher in diastolic BP

without dorsal support, which corroborates the data of Cushman et al, 1990. They were able to conclude that back support has an influence on blood pressure determinations.

The back support either by the mother's lap, better positioning of the wheelchair backrest, better adjustment of the chair backrest or seats, adequate positioning of the infant in the incubator in addition to the proper foot support has a positive effect for better positioning, facilitating interaction with the environment and the other, favoring learning, improves the input of sensory responses, and should therefore be considered in schools, hospitals, home and clinical practice.

A interação entre o organismo e elementos do ambiente ocorre desde o período intrauterino. Essa interação associada às variações de tônus favorecem ao bebê a representações do movimento. Estudiosos relataram que quando o apoio dorsal (suporte dado nas costas) ofertado a um lactente/criança, há melhora do controle postural de tronco e cabeça e consequentemente o tempo de atenção do lactente/criança em relação ao ambiente aumenta (Bullinger, 2000; Pry et al., 2000). Além do apoio dorsal pesquisadores estudaram e relataram o efeito positivo do apoio plantar (apoio nos pés). André Bullinger concebeu o desenvolvimento sensório-motor da criança enraizado nas muitas e complexas interações que ocorrem entre fluxos sensoriais e sensações tônicas profundas. A integração desses dois componentes dá origem a uma função proprioceptiva, que ele definiu como uma coordenação não biológica que pode ser modificada de acordo com as interações entre o organismo e seus arredores. A integração mútua só pode ocorrer em um contexto de percepção ativa (Jouen et al., 2015). Gidley e cols. sugerem que um dos passos cruciais para o desenvolvimento motor é a habilidade de formação de modelos internos, ou seja, melhorar a performance através de erros e ter a predição de consequencias sensoriais dos comandos motores (Gidley et al., 2008).

Para que ocorra a manutenção do equilíbrio corporal é necessário que *inputs* sensoriais (visuais, auditivos, propriocepção) estejam em arranjo com o sistema motor. Cherng et al., 2001 compararam a influência da entrada somatossensorial e entrada sensório-visual em um grupo de 20 crianças, de 4 a 6 anos de idade, com transtorno da coordenação do desenvolvimento (TCD) em comparação à um grupo controle pareado por idade e sexo. Três tipos de entradas visuais (olhos abertos, olhos fechados e quando os sujeitos usavam

uma cúpula que bloqueava parcialmente a visão e se movia com o movimento da cabeça, a entrada visual era chamada de referência de oscilação) e dois tipos de entrada somatossensorial (pés apoiados em uma plataforma fixa e pés apoiados em uma espuma na plataforma fixa) foram variadas fatorialmente para produzir seis condições sensoriais. Os resultados desse estudo sugerem que a estabilidade em pé das crianças com TCD foi significativamente menor do que a das crianças controle em todas as condições sensoriais, especialmente na entrada somatossensorial de pés apoiados em uma espuma na plataforma fixa em comparação com pés apoiados em uma plataforma fixa.

Al Abdulwahab e Kachanathu, 2015 hipotetizaram que pequenas alterações biomecânicas no suporte plantar possam influenciar estratégias para manter o equilíbrio postural. Portanto, o objetivo deste estudo foi investigar o papel de vários graus de postura do pé nos componentes estáticos e dinâmicos do equilíbrio em pé em uma população adulta saudável. A pesquisa confirmou que existe uma correlação entre os vários graus de postura do pé na manutenção do equilíbrio postural (em pé), particularmente no componente dinâmico.

Kornilova et al., 2004 realizaram uma investigação do sistema oculomotor após 7 dias de imersão a seco em indivíduos que foram privados e outros que obtiveram estimulação aferente ou seja; suporte nos pé durante o período de imersão a seco. A imersão a seco (DI) é um dos modelos de microgravidade mais amplamente utilizados no solo. O DI reproduz praticamente todo o espectro de alterações nos sistemas corporais durante a exposição à microgravidade como nos vôos espaciais de curto prazo (Tomilovskava et al., 2019). O objetivo do estudo de Kornilova et al., 2004 era determinar os efeitos

da aferência proprioceptiva, tátil e de suporte plantar nos parâmetros de rastreio visual e o significado da entrada de suporte plantar para a função ocular. O grupo de indivíduos sem estimulação de suporte plantar exibiu desvios omnidirecionais nos parâmetros de rastreamento ocular durante todo o período do experimento. No grupo de indivíduos que receberam estímulo de suporte plantar, esses parâmetros foram pouco diferentes dos valores basais (valores de função de rastreio visual testada antes do experimento). Assim como Kornilova et al., 2004 outro grupo de pesquisadores russos Zobova, Miller, Badakva, 2010 avaliaram o efeito da estimulação mecânica das zonas de apoio plantar para mitigar os efeitos da falta de carga de suporte nos músculos posturais influenciando as sacadas oculares durante a privação prolongada de suporte (durante 7 dias de imersão a seco). A análise de dados mostrou que a estimulação mecânica das zonas de suporte plantar moderou alterações significativas na cinemática da sacada ocular.

Pereira e Parlato-Oliveira, 2015 avaliaram crianças com transtorno do espectro do autismo e crianças com desenvolvimento típico comparando o tempo de fixação do olhar, através do *eye tracking*, entre grupos com e sem o apoio dorsal e plantar. Como resultado da pesquisa houve aumento na fixação do olhar em ambos os grupos com o apoio dorsal e plantar. Estes dados são importantes para a prática clínica com autistas porque qualquer aumento na fixação/rastreio visual é favorável, uma vez que uma das características clínicas mais proeminentes no autismo, é a diminuição ou ausência de contato ocular. Os pesquisadores destacaram a importância do apoio dorsal e plantar para a melhor relação ao ambiente favorecendo interação social e o aprendizado. Destacaram ainda que a prática do apoio dorsal pode ser

utilizada tanto na clinica como nas escolas em crianças com desenvolvimento normal ou com algum comprometimento (Pereira e Parlato-Oliveira, 2015).

A pesquisa de Angsupaisal et al., 2017 foi conduzida com um grupo de 19 crianças com paralisia cerebral espástica unilateral ou bilateral. As crianças foram testadas nas seguintes situações: na posição sentada (em uma maca com estofado macio) e na posição sentada com inclinação de 15º para frente com e sem apoio plantar em ambas as posições. Uma tarefa de alcance de objeto (agarrar o objeto em velocidade própria com a mão dominante) e a cinemática da estabilidade da cabeça foram avaliadas. A hipótese dos autores seria que o efeito imediato do apoio plantar daria estabilidade de cabeça, ou seja, um balanço angular menor de cabeça e uma melhor qualidade na tarefa de alcance. Como a instabilidade postural durante o alcance é maior em crianças com PC espástica bilateral que unilateral os autores acreditavam que crianças com paralisia cerebral espástica bilateral teriam melhor resultado com apoio plantar. Como conclusão desse estudo a posição com inclinação de 15º para frente na posição sentada e o apoio plantar não afetaram estabilidade da cabeça. A tarefa de alcance em crianças com PC espástica unilateral obteve melhores resultados com inclinação para frente; em crianças com PC espástica bilateral inclinado para a frente piora o alcance- efeitos são independentes do apoio plantar. Seguindo essa linha de estudo descrito previamente o mesmo grupo de pesquisadores Angsupaisal et al., 2019 deram continuidade à metodologia acrescentando simultaneamente a eletromiografia de superfície dos músculos do pescoço, tronco e braço e a cinemática da cabeça e do braço com o objetivo de avaliar o efeito da inclinação em 15° para frente na posição sentada e apoio plantar em crianças com PC nos ajustes posturais durante uma tarefa de alcance. Em conclusão

do estudo, em termos de ajustes posturais durante a tarefa de alcance com inclinação de 15º para a frente, o apoio plantar aumentou a capacidade das crianças de modular a atividade extensora do tronco, o que foi associado à melhoria na qualidade da tarefa do alcance.

Um estudo referente a cadeiras de rodas e apoio dorsal foi desenvolvido por Alkhateeb et cols., 2019 com paralisados cerebrais de grau moderado a grave que não conseguiam locomover. Segundo os autores períodos longos na cadeira de rodas podem afetar o alinhamento cefálico e cervical. A pesquisa teve por objetivo examinar o efeito do apoio dorsal na cadeira de rodas ajustando os ângulos do alinhamento postural da cabeça, pescoço e ombros em pessoas com paralisia cerebral. Eles concluíram que o apoio dorsal na cadeira de rodas forneceria um ângulo sagital de cabeça e pescoço mais apropriado para essa população. Kobara et al., 2015 tiveram por objetivo investigar a influência da diferença na posição do eixo rotacional do apoio dorsal na direção vertical sobre a força horizontal aplicada nas nádegas para prevenir úlceras de decúbito em adultos usuários de cadeira de rodas. Como resultado do estudo sugeriram que a cadeira de rodas deveria ser capaz de ajustar a altura do eixo rotacional do apoio para as costas para reduzir a força horizontal aplicada às nádegas. Destacaram que o estudo mostra uma das sugestões sobre a abordagem do sentar para a prevenção de úlceras de decúbito (Kobara et al., 2015).

As recomendações do apoio dorsal e apoio plantar foram referenciadas durante a medição da pressão arterial (PA) mas nem sempre são seguidas na prática clínica (Ringrose et al., 2017). Uma pesquisa conduzida na década de 90, estudou o efeito do apoio dorsal e da cabeça do estetoscópio nas

determinações da pressão arterial no indivíduo na posição sentada. As medidas da pressão arterial foram realizadas em adultos do sexo masculino com histórico de hipertensão em duas situações: em uma cadeira com apoio de costas *versus* em uma mesa de exame sem apoio de costas e com cabeça de estetoscópio sino-diafragma em cada condição. A PA sistólica não foi significativamente diferente entre as duas situações, entretanto a PA diastólica (PAD) sem apoio de costas foi 6,5 mm Hg maior (P menor que 0,0001) do que a PAD com apoio de costas (Cushman et al, 1990). Um estudo realizado em adultos por Ringrose et al., 2017 teve por objetivo determinar se o apoio dorsal e plantar afetaria as medidas médias da PA oscilométrica. A provisão de suporte dorsal e plantar teve um pequeno efeito na média da PA oscilométrica. A magnitude do efeito foi maior na PA diastólica sem apoio dorsal, o que corroborou com os dados de Cushman et al, 1990. Puderam concluir que o apoio dorsal tem influência nas determinações da pressão arterial.

O apoio dorsal, seja pelo colo materno, pelo encosto da cadeira de rodas, encosto de cadeira ou bancos, pelo suporte em incubadoras, além do suporte adequado aos pés, tem efeito positivo para melhor posicionamento, facilitando a interação com o meio e o outro, favorecendo a aprendizagem, melhora a entrada das respostas sensoriais, devendo ser portanto considerado nos ambientes familiar, escolar, hospitalar e na prática clinica.

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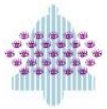

CHAPTER 2

STUDY OF AUDITORY AND VISUAL SENSORY RESPONSES IN INFANTS AGED 6 TO 15 MONTHS WITH AND WITHOUT BACK AND FOOT SUPPORT

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Study of auditory and visual sensory responses in infants aged 6 to 15 months with and without back and foot support

Estudo das respostas sensoriais auditiva e visual em lactentes de 6 a 15 meses com e sem apoio dorsal e plantar

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Abstract

Introduction: Multisensory integration can be defined as the processes used by humans to respond to convergent inputs of multiple sensory modalities. The integration of auditory and visual stimuli is of particular interest due to their role in speech perception that has a visual and an auditory component. **Objectives:** To evaluate auditory and visual sensory responses in infants aged 6 to 15 months with and without back and foot support. **Methods**: The present research proposes a cross-sectional analytical observational study. Seventy infants were submitted to auditory behavior evaluation and evaluation of visual acuity in two situations with and without back and foot support. We evaluated the response of infants in each auditory location/visual orientation in relation to latency, that is, the moment when the auditory/visual stimulus is given by the researcher to the moment of auditory/visual response by the infant. Totalized 12 sound locations and 4 visual orientations. **Results:** Statistical significance in auditory variables was found. Comparing the median from visual and auditory tests between categories with and without support, we found clinical significance. **Conclusions:** The strategy of back and foot support is an alternative that can be used in clinical, home, hospital and educational practice to favor learning as well as the input of sensory responses.

Keywords: Psychomotor performance, Visual perception, Auditory Perception, Infant.

Resumo Estruturado

Introdução: A integração multisensorial pode ser definida como os processos utilizados por seres humanos para responder a insumos convergentes de múltiplas modalidades sensoriais. A integração dos estímulos auditivos e visuais é de particular interesse devido ao seu papel na percepção da fala que tem um componente visual e um componente auditivo. **Objetivos:** Avaliar as respostas sensoriais auditivas e visuais em lactentes de 6 a 15 meses com e sem o apoio dorsal e plantar. **Métodos:** A presente pesquisa propõe um estudo observacional analítico transversal. Setenta lactentes foram submetidos à avaliação do comportamento auditivo e avaliação da acuidade visual em duas situações com e sem apoio plantar e dorsal. Avaliamos a resposta dos lactentes em cada localização auditiva/ orientação visual em relação à latência, ou seja, o momento em que o estímulo auditivo/visual é dado pelo pesquisador ao momento de resposta auditiva/visual do lactente. Totalizaram 12 localizações auditivas e 4 orientações visuais. **Resultados:** Foi encontrada significância estatística nas variáveis auditivas. Comparando a mediana dos testes visuais e auditivos entre categorias com e sem apoio, encontramos significado clínico. **Conclusões:** A estratégia de apoio dorsal e plantar é uma alternativa que pode ser utilizada na prática clínica, domiciliar, hospitalar e educacional para favorecer a aprendizagem assim como a entrada de respostas sensoriais.

Descritores: Desempenho Psicomotor, Percepção Visual, Percepção Auditiva, Lactente.

Introduction

The integration of multimodal sensory information is fundamental for many aspects of human behavior. In our daily lives we continuously receive the input of all sensory modalities. Humans should effectively and efficiently process this multisensory information. Multisensory integration can be defined as the processes used by humans and animals to respond to convergent inputs of multiple sensory modalities (Murray et al., 2016). The integration of information through sensory modalities into unified perceptions is a fundamental sensory process on which other cognitive processes are based (Baum and Stevenson, 2017).

The first year of life is critical to the development of human. In this period vision and hearing are developing. Visual acuity can be evaluated during the first year of life by means of a preference look test to evaluate the infant's visual detection ability (Martini et al., 2014) while the development of hearing can be evaluated by evaluating the Auditory Behavior in children from 0 to 24 months (Northern and Downs, 1974).

The interaction between the organism and elements of the environment occurs since the intrauterine period. This interaction associated with variations in tone favor the baby's representation of movement. Postural control and tonic-sensory balance allow interaction with its environment and social involvement favoring learning. A theory presented reports that a back and foot support (support on the back and feet) given to a infant/child, there is an improvement in postural control of the trunk and head and consequently the attention time of the infant/child increases (Bullinger, 2000; Pry et al., 2000). Numerous results are consistent with the idea that motor learning is associated

with changes in proprioception where the training of this aspect can increase learning and the benefit is better when the subject passively experiences the movement to be achieved (Bullinger, 2000; Pry et al., 2000; Wong et al., 2012).

Assuming that back and foot support enables better interaction with the environment that favors learning (Bullinger, 2000; Pry et al., 2000; Pereira and Parlato-Oliveira, 2015) we believe that knowing the performance of the infant in relation to sensory inputs with and without back and foot support can guide the use of this method in clinical interventions, in school, hospital scope, in domicile. The aim of our study was to evaluate auditory and visual sensory responses in infants aged 6 to 15 months with and without back and foot support.

Methods

The present research proposes a cross-sectional analytical observational study. This project was approved by the Research Ethics Committee (COEP) of the Federal University of Minas Gerais, under the number 54879816.0.0000.5149.

Regarding the sample of the research, 70 infants from 6 to 15 months (31 female and 39 male) were evaluated who were recruited in the philanthropic day care centers of Belo Horizonte and the region. All infants in our sample were submitted to Universal Newborn Hearing Screening ("Teste da Orelhinha"- common called in portuguese) and the Red Reflex Test (Teste do Olhinho- common called in portuguese) at birth.

The Universal Newborn Hearing Screening (UNHS) aims to identify hearing loss (unilateral or bilateral) as early as possible in neonates and infants should preferably be performed in the first days of life (24h to 48h) in the maternity Ward or during the first month of life, except in cases when the infant's health does not allow the examinations to be performed. UNHS consists of the test and retest with physiological and electrophysiological measurements of hearing with the use of the examination of Evoked Otoacoustic Emissions (EOA) which is a fast, noninvasive examination, with high sensitivity and specificity, capable of identifying most cochlear hearing losses around 30-35 dB. If no satisfactory response is obtained, repeat the EOA test within 30 days. If the alteration persists, immediately perform the Brainstem Auditory Evoked Potential that evaluates the integrity of the auditory pathway from the auditory nerve to the brainstem and occurs during the first 8 milliseconds (ms) from the beginning of acoustic stimulation. The auditory evoked potential of

the brainstem in addition to determining the minimum level of auditory electrophysiological response, helps in the characterization of the type of hearing loss and in the topographic location of the lesion. UNHS should be considered as a first step in a program for the identification, diagnosis, treatment and qualification/rehabilitation of hearing impaired infants (Ministério da Saúde, 2012; Matas et al, 2005; Berrettini et al, 2017). The result of Newborn Hearing Screening is found in the child's booklet and the examination is performed by the speech therapist or ENT doctors.

The Red Reflex Test (Teste do Olhinho) aims to detect any alteration that may cause obstruction in the visual axis and a possible blindness and should be performed in all infants after birth or until the first 2 months of life. The red reflex test is used to track abnormalities of the bottom of the eye (posterior segment) and opacities on the visual axis, such as cataracts or corneal opacity. It is a simple, fast and painless examination, which consists of identifying a red reflection, which appears when a beam of light illuminates the infant's eye. For proper visualization of the reflection, it is necessary that the optical axis is free, that is, without any obstacle to the input and output of light by the pupil. This examination should be performed in a dark room of a child with open eyes, preferably voluntarily where an ophthalmoscope is mantain near the examiner's eye and focused on the pupil is used to visualize the eyes 12 to 18 inches away from the infant's eyes. To be considered normal or negative, the red reflex of both eyes must be symmetrical. Dark spots on the red reflex, dullred reflex on one side, lack of red reflex, or the presence of white reflex (retinal reflex) are indications for referral to an ophthalmologist. The “Olhinho” Test can detect any alteration that causes obstruction in the visual axis, such as cataracts, congenital glaucoma and other problems – whose early

identification can enable treatment at the right time and normal development of vision. (Sociedade Brasileira de Pediatria, 2018; American Academy of Pediatrics, 2002). The result of the Red Reflex Test is found in the child's booklet and the examination is performed by the pediatrician or ophthalmologist.

Inclusion Criteria in the research

- ✓ Infants aged between 6 and 15 months with Hearing and Red Reflex Test within normality at birth or until the time of the research;
- ✓ The responsibles from infants have agreed and signed the Informed Consent Form (Appendice 1).

Exclusion criteria in the research

- ✓ The withdrawal by the infant's responsible to participate in the research;
- ✓ Situations that made the evaluations feasible (such as agitation, tiredness, crying on the part of the infant);
- ✓ Infants who did not have yet adequate head support, which made visual and auditory evaluation not possible to evaluate.

The research lasting approximately 30 minutes with each infant in a single meeting was performed in the laboratory of infants called *babylab*, room 291 of the Faculty of Medicine of the Federal University of Minas Gerais and in philanthropic daycare centers. Because structured evaluations were to be portable the researcher carried out the research where it was most convenient for babies and their families.

Description of the Research Procedures

Anamnesis

Data were collected in relation to previous history, such as gestational age, complications in the prenatal, peri and postnatal period, date of birth, gender, performance of the Hearing(Teste da Orelhinha) and Red Reflex Test.

Auditory Behavior Assessment

Auditory behavior assessment is a subjective procedure that can be performed in any infant from 0 to 24 months of age. In this technique, the professional presents some type of auditory stimulus in the right or left ear, calibrated or not (guizo, bell, drum), and observes the child's response to the presence of sound, that is, observes behavioral responses (Figure 1). This response is interpreted by the professional as the child "listening" to the stimulus. The evaluation of auditory behavior with instrumental sounds is easy to manipulate by experienced evaluators. Therefore, the knowledge of the characteristics of the sound stimulus used in the audiological evaluation and the development of auditory function are paramount to understand and relate the reactions of the infant in the face of the presentation of stimuli (Northern, Downs, 1974).

In the auditory evaluation of the present study, the guizo instrument (frequency range of 10000 - 12000Hz in the intensity of 80dBNPS) and the bell (frequency range of 5000 to 8000Hz at the intensity of 90dBNPS) were used. The evaluation was conducted in a state of alert of the infant who was sitting in the maternal lap (described in the back support item) facing an intern- who distracts the infant- while the researcher, behind the child, it presents the sound stimuli 20 cm from the ear pavilion of the infant in both ears (one ear at a time) in 6 different sound locations (right and left lateral location, right and left indirect/direct location downwards, right and left

indirect/direct location upwards) lasting the sound stimulus of up to 10 seconds. Totalized 12 sound locations (6 with Guizo and 6 with Bell). We evaluated the response of infants in each location in relation to latency, that is, the moment when the auditory stimulus is esponse by the infant. The normality criterion is based on the presence or absence of previously defined motor responses of infants in relation of sound stimuli (Northern, Downs, 1974).

Figure 1: Development of Auditory Behavior (Northern e Downs, 1974)

Visual Acuity Assessment

An estimate of the function of some parts of the visual pathways can be made using visual acuity measurements with detection and discrimination tests. In our research we used LEA GRATINGS test, which is a detection test that is easy to apply. The LEA GRATINGS test uses paddles to present the grids. Grids are defined by frequency, that is, the number of pairs of bands or cycles in black and white, within a degree of visual angle. In the test, striped paddles are shown to the infant that detects the presence of parallel lines of decreasing width. When a striped pattern is presented, simultaneously with a gray paddle of the same size and luminosity, the child is likely to look at the striped pattern, because there is more to see than on a gray surface. Normally, the

child will follow the movement of the striped pattern if they see it. If the child has difficulty seeing visual information in motion, there will be no movement to follow, but the child can quickly make a saccade to the striped pattern when the pattern stops. This test proved to be useful for testing the vision of children with brain damage (Hyvärinen, 2009).

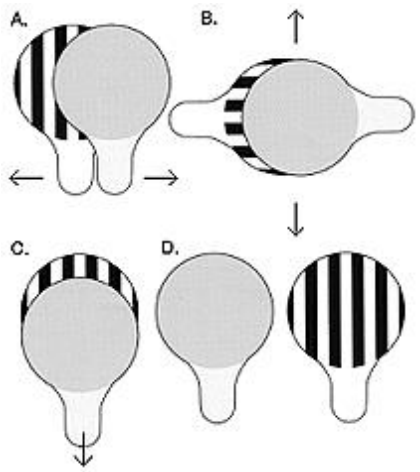

Figure 2: Visual orientations

The experiment was conducted in a quiet room. The evaluation was conducted in a state of alert of the infant who was sitting in the maternal lap (described in the back support item). The visual paddles were presented to infants in a distance of 43 cm in four different orientations: horizontal, vertical and two diagonal directions (Figure 2). We evaluated the response of infants in each orientation in relation to latency, that is, the moment when the visual stimulus is given by the researcher to the moment of visual response by the infant. The researcher wore black clothes during the test to avoid visual conflicts that could distract and/or confuse the infant.

Back and Foot Support

Each infant in the category with back and foot support during visual and auditory tests had their backs supported on the mother/caregiver's abdomen and the infant's feet were wrapped by the hands of the mother/caregiver and supported on the mother / caregiver's leg. In the category without back and foot support, infants had their backs away from the mother/caregiver's

abdomen and the baby's feet were not be enveloped by the mother/ caregiver's hand remaining in front of the mother's knee (Figures 3-6).

Figure 3: Visual test in infant 15months with back and foot support

Figure 4: Visual test in infant 10 months without back and foot support

Figure 5: Hearing test in infant 12m with back and foot support

Figure 6: Hearing test in infant 6m without back and foot support

The auditory and visual tests were conducted randomly which 50% of our sample were tested firstly with back and foot support and 50% firstly without back and foot support. If hearing and/or visual alterations were suspected necessary referrals would be conducted.

Data analysis methodology

The information obtained in the present study was analyzed individually and jointly through statistical tools and content analysis. The information obtained was stored in a database.

Visual statistical analysis:

A sample size of at least 65 infants would obtain 80% statistical power in detecting an average difference of at least 12 ms of visual latency between groups with and without back and foot support. A standard deviation of the difference equal to 0.34 was considered in the calculations, as observed in a pilot study made with n=14 infants. The test used was the t-student test for paired samples, at the significance level of 5%. The software used was GPower 3.0.10.

Auditory statistical analysis:

A sample size of at least 61 infants would obtain 80% statistical power in detecting an average difference of at least 15 ms of auditory latency between groups with and without back and foot support. A standard deviation of the difference equal to 0.41 was considered in the calculations, as observed in a pilot study made with n=10 infants. The test used was the t-student test for paired samples, at the significance level of 5%. The software used was GPower 3.0.10.

A professional tool named ELAN-The Language Archive (Nijmegen, The Netherlands) is used for annotating and transcribing, manual and semi-automatically, audio or video recordings and was used as a support for the analysis of the auditory and visual data of our research. ELAN is applied in research in human and social sciences (linguistic documentation, sign language and gesture research) for qualitative and quantitative documentation

and analysis purposes. We inserted in the ELAN software videos of the visual and hearing assessment of each infant with and without back and foot support with the respective spectrogram referring to the visual and hearing assessment. After that we analyzed (segmented and noted) the visual orientations and auditory locations. The analyzes were conducted in a double-blind study. A statistical analysis regarding the latency of visual orientation and auditory locations was generated by the ELAN software. This analysis was used to compare quantitative variables.

Results

Statistical analysis began by describing the data for quantitative variables and were described through the median (Q1;Q3) due to the nonnormal distribution that was verified by the Shapiro Wilk test. In the comparison of quantitative variables, Wilcoxon's test was used due the nonnormal distribution for paired groups (IBM SPSS version 20.0 software). The significance level considered was $p<0.05$.

We evaluated 70 infants aged 6-15 months from Belo Horizonte and region, 31 female infants and 39 male infants. According to the sample 61 infants performed the evaluation of auditory behavior with 60 normal results. One infant had anormal result (long latency response for age) and the family and school received orientations; was not necessary complementary exams. Regarding visual evaluation in a sample of 65 infants; 64 infants had results within normal range. One infant had anormal result (long latency response) which school and pediatrician received orientations.

The response of infants in each auditory lacation corresponds to response latency, that is, the moment when auditory stimulation is given by the researcher at the moment of auditory response by the infant. In each infant we evaluated 12 auditory locations with support (6 with Bell and 6 with Guizo) and 12 auditory locations without support. In accordance to the statistical analysis comparing the variables between categories with and without support (i.e.; left lateral location Bell *with* support in comparison to left lateral location Bell *without* support) we found statistical significance in 2 of 12 auditory variables (table 1).

Table 1. Comparison of the auditory variables between categories with and without support with statistical significance.

Descriptives	**Median with support**	**Median without support**	**p-value**
Left location downwards bell	**0,755**(0,528-1,058)	0,870(0,62-1,27)	0,014*
Left location upwards guizo	**0,7**(0,522-0,94)	0,84(0,58-1,095)	0,024*

* Median (1^{rst} Q- 3^{thr} Q)

Comparing the median of each variable auditory between categories with and without support, 7 from 12 variables had lower latency response with support which demonstrates a clinical significance (table 2).

Table 2. Comparison of the median of variable auditory between categories with and without support.

Descriptives	Median with support	Median without support
Right location upwards guizo	0,78	0,79
Left lateral location guizo	0,65	0,72
Left location upwards guizo	0,70	0,84
Left location downwards guizo	0,83	0,86
Right location downwards bell	0,86	0,94
Left lateral location bell	0,68	0,71
Left location downwards bell	0,75	0,87

Table 3 shows the median result from visual response (sum of the visual responses from 4 orientations: horizontal, vertical and two diagonal directions) of infants with and without support. Each visual orientation response corresponds to response latency, that is, the moment when visual stimulation is given by the researcher at the moment of visual response by the infant. No statistical significance was found.

Table 3. Median from visual response with and without support.[a]

Descriptives	Median with support	Median without support	p-value
Visual test	**,2100**	,2300	,809

a. **Test Statistics-** Wilcoxon Signed Ranks Test

Comparing the median from visual test between categories with and without support, with support had lower latency response which demonstrates a clinical significance (table 3).

Discussion

The first year of life is critical to the development of human beings. In this period vision and hearing are developing. The visual and auditory sensory systems can be thought of as serving a single role - to gather information

about our environment so that we may adapt our behavior accordingly (Braga et al., 2016). In individuals with typical development access to information of various modalities provides many benefits, including improvements in reaction time, identification accuracy and processing efficiency (Bremner et al., 2012). The integration of auditory and visual stimuli is of particular interest due to its role in speech perception, which has a visual component (face) and an auditory component (voice) (Stevenson et al., 2014). It is proposed that the ability to integrate this complex audiovisual stimulus can provide the basis for social development, as well as communication and language (Bahrick and Todd, 2012; Cascio et al., 2016). The integration of information through sensory modalities into unified perceptions is a fundamental sensory process on which other cognitive processes are based (Baum and Stevenson, 2017).

Braga et al., 2016 investigate in 20 healthy volunteers (range 21-36 years old) whether task-evoked eye movements during an auditory task can predict the magnitude of activity within the dorsal frontoparietal network. A significant difference in mean gaze position was observed when individuals were cued to listen to their left vs. right ear. No effects on vertical gaze postion were observed for right-left or high-low discriminations.

Pereira e Parlato, 2015 tested the duration of eye fixation in the visual stimuli in autistic children compared to children with normal development using eye tracking and the back support. According to a paired t test used, was no significant difference in the analysis of difference of duration of eye fixation in the visual stimuli with and without back support. Therefore when evaluating the mean of the duration of eye fixation of visual stimuli separately

with and without back support in both groups they found a clinical significance for the most used stimuli. These data corroborate our study.

A study conducted on 85 adults by Ringrose et al., 2017 aimed to determine whether back and foot support would affect the mean measurements of oscillometric blood pressure (BP). According to the results the mean BP levels without dorsal support were *slightly* higher than with dorsal support. The mean BP with the feet pending was *slightly* lower than with the feet supported. In our visual analysis the latency response was *slightly* lower with the feet and back supported with similar results from Ringrose et al., 2017.

Conclusion

Researchers suggest the back and foot support strategy as an alternative that should be used in clinical, home, hospital and educational practice, as it provides better interaction with the environment, favoring interpersonal relationships, stimulating sensory processing and helping the individual to adapt to everyday situations (Bullinger, 2000; Pry et al, 2000; Kobara et al, 2015; Ringrose et al, 2017; Pereira e Parlato-Oliveira, 2015).

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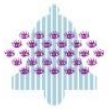

CHAPTER 3

ORIENTING RESPONSES TO VISUAL EXPERIMENTS IN CHILDREN: TESTING BULIINGER'S MODEL

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Adapted to: ABO-Arquivos Brasileiros de Oftalmologia

Orientation and fixation visual response to visual experiments in children: use of back and foot support

Resposta de orientação e fixação visual a experimentos visuais em crianças: uso do apoio dorsal e plantar

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Abstract

Purpose: Report the effects of back and foot support on visual sensory input during visual tasks, increasing eye fixation and response with lower latency in visual tasks due to back and foot support, the child requires less energy for postural control and becomes more adept at social interaction.

Methods: We realized two visual tasks in two different sample. In experiment 1 we used LEA GRATINGS detection visual test in 10 infants of 6-15 months and experiment 2 we investigated the duration of eye fixation in 10 children 2-5 years old with autistic disorder spectrum using eye tracking. The experiments were conducted randomly.

Results: According to a paired t test used there was no significant difference in the duration of eye fixation in the visual stimuli as well as in the latency response from visual detection test with and without back and foot support in the evaluated sample. However, we found that of 10 infants evaluated in 6, the average response latency with back and foot support was lower, which shows a clinical significance. Similar result found in relation the mean of the duration of eye fixation of visual stimuli with and without back and foot support in autism.

Conclusions: An increase in visual attention in autism is important since of the most prominent clinical features in autism is the decrease or absence of eye contact. In infants better visual response favors interpersonal relationships contributing to language development.

Keywords: Psychomotor performance, visual perception, autism spectrum disorder, infant, proprioception

Resumo

Objetivos: Relatar os efeitos do apoio dorsal e plantar na entrada sensorial visual durante tarefas visuais, aumentando a fixação ocular e resposta com latência menor nas tarefas visuais devido ao apoio dorsal e plantar, a criança requer menos energia para controle postural e se torna mais adepta à interação social. **Métodos**: Realizamos duas tarefas visuais em duas amostras diferentes. No experimento 1 usamos o teste de detecção visual LEA GRATINGS em 10 bebês de 6 a 15 meses e no experimento 2 investigamos a duração da fixação ocular em 10 crianças de 2 a 5 anos com transtorno do espectro autista usando *eye tracking*. Os experimentos foram conduzidos de forma randomizada. **Resultados:** De acordo com o teste t pareado, não houve diferença significativa na duração da fixação ocular nos estímulos visuais, bem como na resposta de latência do teste de detecção visual com e sem apoio dorsal e plantar na amostra avaliada. No entanto, percebemos que dos 10 lactentes avaliados em 6, a latência média de resposta com apoio de costas e pés foi menor, o que mostra um significado clínico. Resultado semelhante encontrado em relação à média da duração da fixação ocular dos estímulos visuais com e sem apoio dorsal e plantar no autismo. **Conclusões:** Um aumento da atenção visual é importante, pois uma das características clínicas mais proeminentes no autismo é a diminuição ou ausência de contato visual. Em bebês, a melhora da resposta visual favorece as relações interpessoais contribuindo para o desenvolvimento da linguagem.

Descritores: Desempenho Psicomotor, Percepção Visual, Transtorno do Espectro Autista, Lactente, Propriocepção

Introduction

Perceptual development requires infants to adapt their perceptual system to the structures and statistical information of their environment (Emberson,2017). Human perception cannot be taken as an exact copy of the world; all perception is thus necessarily an interpretation of the world, also referring up for visual perception (Parlato-Oliveira, 2010). Visual information processing is a prerequisite for interaction with and interpretation of the environment (Kooiker et al., 2014).

In the sensorimotor period, there is interaction between the body and other parts of the environment where sensorimotor signals stimulate mental activity. Postural control and tonic-sensory balance allow interact with their environment and social involvement. When a back support (support given on back) is offered to the child they require less energy to control your posture and therefore become more available for interaction with other, increasing the attention span (Bullinger, 2000). In addition to the back support researchers study and report the positive effect of foot support.

Autism literature suggests abnormalities in the use of look, an important feature in autistic children and there is a hypothesis that autism would be characterized by a disorder of postural regulation (Bullinger, 2000; Pry et al., 2000). When the baby presents poor eye contact to family members can generate confusion that leads to the suspicion of autism (Vasconcelos e Parlato-Oliveira, 2016). Autistic children prefer to fix their gaze on objects rather than on faces, which is not the case in children with low vision, whose visual impairment is not so selective (Vasconcelos,2008). Research regarding the movements of the eye and visual behavior in autistic children more

thoroughly can provide important insights into the nature and causes of abnormal gaze behavior (Pereira e Parlato-Oliveira, 2015)

Measurement of eye movements is a direct method to study orienting behavior to visual stimuli. Studies of eye movements during face recognition, visual search and perception of complex scenes show that saccade sequences and fixations relate to perceptual and cognitive processing. (Pel et al., 2010). Good vision is essential for a child's development and depends on the proper functioning of specialized ocular and cerebral structures. Currently there are several diagnostic methods avaiable to assess oculomotor and visual impairments in children (Kooiker et al., 2016). In the first years of life, visual function can be assessed with behavioural techiniques that are based on the observation and assessment of spontaneous or elicited visual behaviours (Mercuri et al., 2007; Ricci et al., 2008).

The aim of this study is to report the positive influence of back and foot support in visual sensory input during visual tasks.

Methods

This research conducted at Federal University of Minas Gerais-Faculty of Medicine proposes a cross sectional observational study and was approved by the Research Ethics Committee (COEP) of the Federal University of Minas Gerais, under number 54879816.0.0000.5149. Parents were informed about the study by written consent.

We realized two visual tasks in two different sample. In one visual task (experiment 1) we used LEA GRATINGS test (paddles) in order to verify the visual response in ten infants of 6-15 months and in the other visual task (experiment 2) we investigated the duration of eye fixation in ten children 2-5 years old with autistic disorder spectrum using eye tracking. In all visual experiments were conducted randomly with and without back and foot support. All infants in the sample underwent the red reflex test and all children had normal or corrected-to-normal vision evaluated by the ophthalmologist or pediatrician (red reflex test). Back and foot support used in our research is described further in which experiment.

Experiment 1

An estimate of the function of some parts of the visual pathways can be made using visual acuity measurements with detection and discrimination tests. In our experiment 1 with infants, we used LEA GRATINGS test, which is a detection test that is easy to apply with them. The LEA GRATINGS test uses paddles to present the grids. Grids are defined by frequency, that is, the number of pairs of bands or cycles in black and white, within a degree of visual angle. The accuracy of the grid is a different function from the accuracy of the optotype: the stimulus covers a much larger area of the visual field than

an optotype and the detection of the presence of a striped pattern is a brain function different from the discrimination of forms. Therefore, the grid's acuity values should not be converted into optotype acuity values. In the test, striped paddles are shown to the infant that detects the presence of parallel lines of decreasing width, a simpler task than recognizing optotypes. When a striped pattern is presented, simultaneously with a gray paddle of the same size and luminosity, the child is likely to look at the striped pattern, because there is more to see than on a gray surface. Normally, the child will follow the movement of the striped pattern if they see it. If the child has difficulty seeing visual information in motion, there will be no movement to follow, but the child can quickly make a saccade to the striped pattern when the pattern stops. This test proved to be useful for testing the vision of children with brain damage (Hyvärinen,2018).

The experiment was conducted in a quiet room. The visual paddles are presented to infants in four different orientations: horizontal, vertical and two diagonal directions. We evaluated the response of infants in each orientation in relation to latency, that is, the moment when the visual stimulus is given by the researcher to the moment of visual response by the infant. To conduct the test, it is advisable to choose between the distances (between the infant and the examiner) of 28 cm, 43 cm, 85 cm or 115 cm (Hyvärinen,2018). In our research, we used a distance of 43 cm. The researcher wore black clothes during the test to avoid visual conflicts that could distract and/or confuse the infant. Each infant in the category with back and foot support during visual test had their backs supported on the mother/caregiver's abdomen and the infant's feet were wrapped by the hands of the mother/caregiver and supported on the mother / caregiver's leg. In the category without back and foot support,

infants had their backs away from the mother/caregiver's abdomen and the baby's feet were not enveloped by the mother/ caregiver's hand remaining in front of the mother's knee.

Experiment 2

The eye tracking-based paradigm is sensitive to detect visual impairments (Pel et al., 2010) and is reproducible over time in children from 1 year of age(Kooiker et al., 2014). We used eye tracking system at experiment 2 in order to investigate the duration of eye fixation of children with autistic disorder spectrum. The setup consisted of a 22-inch monitor with an integrated infrared eye-tracking system and a desktop computer (RED 500 SMI- SensoMotoric Instruments, Germany). The eye tracking measures eye movements during the presentation of visual stimuli. Several visual measurements as saccades, latency, and duration of eye fixation can be made. This method tells the behavioral discrimination preference of gaze, where visual stimuli cause reflexive eye movements and visual information is processed in the brain (Pel et al., 2010; Boot et al., 2012; Noris et al., 2012; Lahiri et al., 2012). There was no need to use electrodes and mask in any part of the body and a variety of visual stimulus was displayed on the computer where the eyes were measured without the need for verbal tasks or execution of motor commands which facilitates testing in young children and with peculiar behaviors.

The experiments were conducted in a quiet room at ambient light conditions. Each child sat in a comfortable chair at approximately 60 cm distance of eye tracking monitor to ensure efficient tracking of the eyes. In the category with back and foot support the child had their back supported at backrest's chair and feet supported on a bench. In the category without back and foot support the backrest's chair was removed as well as the bench (Figure 1 and figure 2).

Figure 1 and figure 2: children with back and foot support and children without back and foot support respectively

Standardized verbal instructions were given to children before testing and a standardized 5-point calibration procedure of both eyes was performed. The randomly visual sequence of approximately 45seconds was shown in the both categories totaling 90 seconds of experiment with each child. The visual sequence contained 18 black and white figures from facial expressions, figures of objects and figures of smile face.

Results

The statistical test used in our experiments was the t-student test for paired samples, at a 5% significance level. The software used was GPower 3.0.10. The ELAN software was used as a tool to analyze the visual data of our experiment 1, whose applicability occurs in research in human and social sciences for the purposes of documentation and qualitative and quantitative analysis. We inserted in the ELAN software the video of the visual assessment of each infant with and without back and foot support with the respective spectrogram referring to the visual assessment. After that we segmented and noted the visual orientations with and without back and foot support regarding the assessment of visual acuity. A statistical analysis regarding the latency of visual orientation with and without the infant's back and foot support was generated by the ELAN software. This analysis was used to compare quantitative variables (figure 3).

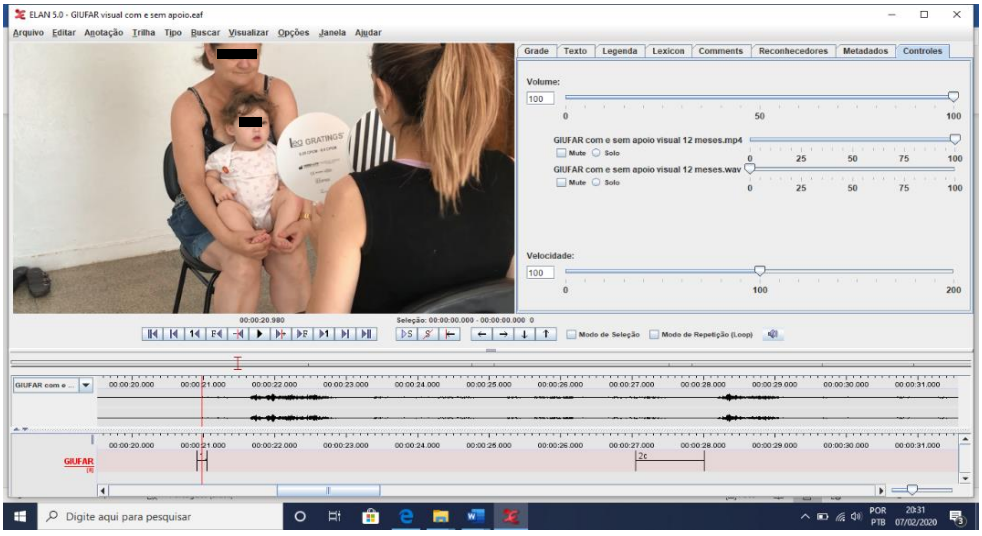

Figure 3: ELAN software with video and spectogram from visual evaluation. Video segmented and annotated.

According to a paired t test used, the p value is > 5%, indicating that there was no significant difference in the duration of eye fixation in the visual stimuli as well as in the latency response from visual detection test with and without back and foot support in the evaluated sample.

However, we found that of the 10 infants evaluated in 6 infants, the average response latency with back and foot support was lower, which shows a clinical significance (Table 1). The similar result we found when evaluating the mean of the duration of eye fixation of visual stimuli separately with and without back and foot support in autism, there was an increase in fixing time value in 11 (61%) of the 18 visual stimuli with back and foot support, which shows that was clinical significance for the most used stimuli.

Table 1. Mean of latency response from infants with and without support.

Infant	Mean with support	Mean without support
Infant 1	1,51	1,38
Infant 2	**0,19**	0,43
Infant 3	**0,52**	0,61
Infant 4	1,22	0,93
Infant 5	**0,18**	0,22
Infant 6	**0,16**	0,22
Infant 7	**0,17**	0,38
Infant 8	0,76	0,59
Infant 9	0,48	0,30
Infant 10	**0,24**	0,35

Lower average response latency with dorsal in 6 from 10 infants (paired Student T test).

In relation to the performance of autism children with and without back and foot support, that is, the duration of eye fixation in relation to the sum of all presented visual stimuli with and without back and foot support, the p value was not statistical significance. However, there was clinical significance, by

the fact with back and foot support showed an increase in the value of visual fixation time (Table 2).

Table 2. Comparison with and without back support in autistic with all visual stimuli.

Study variables	with support	without support	p-value
Autistic Visual assessment performance (mean ± SD)	26,80±13,37	26,36±13,92	0,913[1]

1-p-value obtained with the paired Student T test

We described at table 3 the performance data (sum of visual responses in the four different orientations: horizontal, vertical and two diagonal directions) of infants in the visual assessment with and without back and foot support. Regarding performance in the visual assessment, there was no statistical significance or clinical significance.

Table 3. Performance of infants in visual assessment.

Study variables	with support	without support	p-value
Visual assessment performance (mean ± SD)	1,58±0,48	1,46±0,32	0,493[1]

1-p-value obtained with the paired Student T test

Discussion

Russian researchers realized an investigation of the oculomotor system with the purpose to determine the effects of proprioceptive, tactile and foot support on visual pursuit parameters and the significance of foot support input for eye function during the dry immersion period. The sample was composed from individuals who were deprived and others who obtained afferent stimulation ie; foot support. The group of individuals without stimulation of foot support exhibited omnidirectional deviations in the parameters of visual pursuit throughout the period of the experiment. In the group of individuals who received foot support stimulus, these parameters were slightly different from the baseline values (values of visual screening function tested before the experiment) (Kornilova et al., 2004). Another research was carried out on this model has purpose to evaluate the effect of mechanical stimulation of the foot support zones to mitigate the effects of the lack of support load on the postural muscles, influencing the saccades during prolonged deprivation of support (during 7 days of dry immersion). The analysis data showed that the mechanical stimulation of the foot support zones moderated significantly alterations in ocular saccade kinematics (Zobova et al., 2010).

The recommendations of back support and foot support were referenced during the measurement of blood pressure but are not always followed in clinical practice (Ringrose et al., 2017). In our experiments, we choose to use both back and foot support because we believe that the use can favor the entrance of the visual response through proprioception. In the literature, researchers suggest the back and foot support strategy as an alternative that provides better interaction with the environment, stimulating sensory processing and helping the individual to adapt in everyday situations

(Bullinger,2000; Pry et al.,2000; Pereira and Parlato-Oliveira, 2015; Ringrose et al.,2017; Kobara et al., 2015).

Kooiker et al., 2014 measured ocular orienting responses to visual stimuli (such as form, motion, expansion, color, contrast, cartoons) in 80 children with visual impairments and a reference group of 118 typically developing children using eye-tracking system. Test-retest reliability was measured by calculating differences in reaction time and fixation accuracy between two sessions. The authors found that in the reference group and in children with visual impairments (except for motion.) none of the outcome measures significantly differed between sessions. In the second session this stimulus elicited significantly faster reaction times. We found a clinical significance in our results which we believe that is a favorable since any increase in visual attention in autism is important since of the most prominent clinical features in autism is the decrease or absence of eye contact. In infants better visual response favors interpersonal relationships contributing to language development.

The back support by the mother's lap, better positioning of the backrest of the wheelchair, better adjustment of the backrest of the chair or benches, adequate positioning of the infant in the incubator in addition to adequate support for the feet are situations with a positive effect that can be adapted in schools, hospitals, home and clinical practice.

Conclusion

An increase in visual attention in autism is important since of the most prominent clinical features in autism is the decrease or absence of eye contact. In infants better visual response favors interpersonal relationships contributing to language development.

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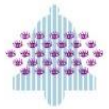

CHAPTER 4

LOOKING AT FOOT SUPPORT IN INFANT: PILOT PROJECT A

LOOKING AT BACK AND FOOT SUPPORT IN ADULTS: PILOT PROJECT B

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Manuscript in preparation

Looking at foot support in infant: Pilot Project [a]
Looking at back and foot support in adults: Pilot Project [b]

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Abstract

Purpose: To test the foot support strategy with infants and the back and foot support strategy with adults (another state of age not yet tested in our research).

Methods: We conducted a paired study with eight infants aged 8-13 months and eight adults aged 29-35 years old who were tested auditory and visually. In infants in 2 categories: *with* back and foot support vs with back and *without* foot support. In adults in 2 categories: *with* back and foot support vs *without* back and foot support.

Results: According to auditory results 3 infants showed lower latency response with back and foot support and in visual test 2 infants showed lower latency response with back and foot support. According to auditory and visual tests results 2 adults showed lower latency response with back and foot support, 1 adult any difference was found with and without support and 1 had lower latency response without support.

Conclusions: Although our samples are small in size and call for more studies we emphazied the importance of appropriate postural control to interact with the environment and favor input of sensory responses.

Keywords: Psychomotor performance, Visual perception, Auditory Perception, Infant, Adult

Marie-Claire Busnel, a great researcher in the area of fetal sensiorality, who due to her studies we know that infants are able to hear from the 26th. pregnancy week (Busnel and Heron, 2010; Parlato-Oliveira, 2019) proposes through a rich meeting in Paris, France to develop a pilot project testing the foot support strategy with infants and the back and foot support strategy with adults (another state of age not yet tested in our research).

Introduction

André Bullinger in his last theoretical elaboration was focused on the force of gravity and treatment of vestibular flow as one of the most important tasks for the baby in order to find an appropriate posture to interact with the environment (Borghini, 2015).

Sparto et al., 2006 reported that visual studies have shown age-related changes in the use of dynamic visual cues for controlling posture. A study conducted with babies aged 5 to 10 months reports the correlation of postural adjustments of sitting position to moving visual environments that usually increase according to age (Bertenthal and Bai 1989; Higgins et al. 1996; Bertenthal et al. 1997). Older babies (7 to 18 months) who can stand and walk show great postural responses to moving visual environments (Lee and Aronson 1974; Butterworth and Hicks 1977; Bertenthal and Bai 1989; Delorme et al. 1989; Foster et al. 1996). The magnitude of the response is possibly related to the acquisition of a new motor ability (Delorme et al. 1989; Foster et al. 1996).

Based on studies in adults, it is generally acknowledged that the lower limbs have an essential role in balancing the body in seated reaching tasks; they prevent falling forward and provide postural stability by means of a load through the feet. The forces acting at the feet facilitate the return of the upper

body to the upright position. In addition, foot-support furnishes sensory information that may be used to control posture.

Here we will present the pilot project in 2 parts. One part is the “Looking at foot support in infant: Pilot Project $_{A}$” and the other is “Looking at back and foot support in adults: Pilot Project $_{b.}$”

Looking at foot support in infant: Pilot Project $_{A}$

Methods

Participants

We conducted a paired study with eight infants aged 8-13 months who were tested auditory and visually in 2 categories: *with* back and foot support vs with back and *without* foot support.

Procedures

Here we are interested at foot support variable. Each infant in the category *with* back and foot support (figure 1) during visual and auditory tests had their backs supported on the mother/caregiver's abdomen and the infant's feet were wrapped by the hands of the mother/caregiver and supported on the mother/caregiver's leg. In the category with back and *without* foot support (figure 2), infants had their backs supported on the mother/caregiver's abdomen and the baby's feet were not be enveloped by the mother/ caregiver's hand remaining in front of the mother's knee. We used Lea Gratings as a visual test and the Auditory behavior assessment as auditory test (described in chapter 3). The auditory and visual tests were conducted randomly.

Figure 1: category with back and foot support at visual test

Figure 2: category with back and *without* foot support at visual test

Results

Four infants were tested auditory and four visually. According to auditory results 3 infants showed lower latency response with back and foot support. In visual test 2 infants showed lower latency response with back and foot support (table 1). No infant presented alteration in visual and auditory tests.

Table 1: Mean result from auditory and visual test with/without foot support.

Auditory test	**With foot support**	**Without foot support**	**Visual test**	**With foot support**	**Without foot support**
Infant 1	**0,72**	1,03	Infant 1	**0,16**	0,29
Infant 2	0,89	0,77	Infant 2	0,2	0,12
Infant 3	**0,64**	0,65	Infant 3	**0,21**	0,34
Infant 4	**0,90**	1,00	Infant 4	0,14	0,08

Looking at back and foot support in adults: Pilot Project $_B$

Methods

Participants

We conducted a paired study with eight adults aged 29-35 years old who were tested auditory and visually in 2 categories: *with* back and foot support vs *without* back and foot support.

Procedures

Each adult in the category *with* back and foot support (figure 3) during visual and auditory tests had their backs supported on the backrest from chair and the adult's feet were resting on the ground. In the category *without* back and foot support (figure 4), adults had their backs away from backrest and the feet were suspended by the adult itself. We used Lea Gratings as a visual test and the High-frequency audiometry (figure 5) as auditory test.

The High-frequency audiometry (over 8kHz) is useful to measure cochlear function, diagnosing sensorial injury earlier than conventional audiometry (Wiley et al.,2001). Conventional audiometry testes frequencies between 250Hz and 8,000Hz, and high-frequency audiometry tests frequencies between 10,000Hz and 20,000Hz. The auditory and visual tests were conducted randomly.

Figure 3: With back and foot support

Figure 4: without back and foot support

Figure 5: Adult during High-frequency audiometry

Results

Four adults were tested auditory and four visually. According to auditory and visual tests results 2 adults showed lower latency response with back and foot support, 1 adult any difference was found with and without support and 1 had lower latency response without support (table 2). One adult presented alteration in the auditory test and complementary tests were performed. The rest of the adults did not present alterations in auditory and visual tests.

Table 2: Mean result from auditory and visual test with/without support in adults.

Auditory test	**With foot support**	**Without foot support**	**Visual test**	**With foot support**	**Without foot support**
Adult 1	0,7	0,49	Adult 1	**0,18**	0,33
Adult 2	**0,54**	0,61	Adult 2	0,22	0,05
Adult 3	**0,48**	0,67	Adult 3	**0,05**	0,06
Adult 4	0,37	0,37	Adult 4	0,04	0,04

These are preliminary results of a pilot study. For greater statistical power it will be necessary an increase in the sample calculation.

Discussion

The importance of tonic dialogue during the first weeks of life as a crucial opportunity to experience a sense of reassurance with regard to tactile contact (Borghini, 2015).

Cherng et al., 2001 compared the influence of somatosensory input and sensory-visual input in a group of 20 children with developmental coordination disorder compared to a control group. Three types of visual inputs (eyes open, eyes closed and when the subjects wore a dome that partially blocked their vision and moved with head movement, the visual input was called sway-referenced) and two types of input somatosensory (foot supported on a fixed platform and foot supported on a foam on the fixed platform) were varied factorfully to produce six sensory conditions. The results suggest that the standing stability of children with developmental coordination disorder was significantly lower than that of control children in all sensory conditions, especially at the somatosensory input of foot supported by a foam on the fixed platform compared to foot supported on a fixed platform.

Another study that focused at foot support was conducted by Al Abdulwahab and Kachanathu, 2015 where the authors hypothesized that small biomechanical changes in foot support can influence strategies to maintain postural balance. The purpose of this study was to investigate the role of various degrees of foot posture in static and dynamic components of foot balance in a healthy adult population. The research confirmed that there is a correlation between various degrees of foot posture in maintaining postural (standing) balance, particularly in the dynamic component.

Conclusion

Although our samples are small in size and call for more studies we emphazied the importance of appropriate postural control to interact with the environment and favor input of sensory responses.

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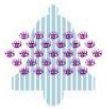

CHAPTER 5

FINAL CONSIDERATIONS

CONSIDERAÇOES FINAIS

It has long been established that neonates and infants with normal hearing between the ages of 4 and 16 months undergo an ordered maturation and development of the behaviors of preventable auditory responses. In the hands of an experienced speech therapist, knowledge of normal auditory behavioral responses can be used as a process of hearing screening. The infant warns, with normal hearing, will respond in a manner provided according to his mental age. It is observed that at least 95% of infants with normal hearing will demonstrate auditory maturation responses (Northern and Downs, 2002).

While you are reading this article, your eyes move (Kooiker et al., 2016). When a loud sound alerts us to a potentially dangerous situation, our eyes orient towards the source of that sound to gain further knowledge of its identity. The auditory and visual systems are intimately linked (Braga et al.,2016). Visual and hearing information processing results from an elaborate network located in the eyes and ears and brain.

In our **first** article *Study of auditory and visual sensory responses in infants aged 6 to 15 months with and without back and foot support* we evaluate the auditory (using Auditory Behavior Assessment) and visual (LEA GRATINGS detection test) sensory responses in 70 infants aged 6 to 15 months with and without back and foot support. As a results statistical significance in auditory variables was found. Comparing the median from visual and auditory tests between categories with and without support, we found clinical significance.

In our **second** article *Orientation and fixation visual response to visual experiments in children: use of back and foot support* we reported the effects of back and foot support on visual sensory input during visual tasks. We

realized two visual tasks in two different sample. In experiment 1 we used LEA GRATINGS detection visual test in 10 infants of 6-15 months and experiment 2 we investigated the duration of eye fixation in 10 children 2-5 years old with autistic disorder spectrum using *eye tracking*. According to our results no significant difference in the duration of eye fixation in the visual stimuli as well as in the latency response from visual detection test with and without back and foot support was found. However, we found that of 10 infants evaluated in 6, the average response latency with back and foot support was lower, which shows a clinical significance. Similar result was found in relation the mean of the duration of eye fixation of visual stimuli with and without back and foot support in autism.

In our **third** study *Looking at foot support in infant: Pilot Project* $_a$ *and Looking at back and foot support in adults: Pilot Project* $_b$ we proposed to test the foot support strategy with infants and the back and foot support strategy with adults. We conducted a study with eight infants aged 8-13 months and eight adults aged 29-35 years old who were tested auditory and visually. As a result, according to auditory results 3 infants showed lower latency response with back and foot support and in visual test 2 infants showed lower latency response with back and foot support. According to auditory and visual tests results 2 adults showed lower latency response with back and foot support, 1 adult any difference was found with and without support and 1 had lower latency response without support.

The ability to integrate auditory and visual information is fundamental to creating a unified percept of the world (Nichols, Grahn, 2016). Early audiovisual experience may be important for normal development of speech

perception (Bergeson et al., 2010). In infants as in one of our study showed better visual response favors interpersonal relationships contributing to language development. In autistic group in our study, for example, an increase in visual attention is important, because one of the most prominent clinical characteristics in autism is decreased or absence of visual contact.

Perceptual development requires infants to adapt their perceptual system to the structures and statistical information of their environment (Emberson,2017). The interaction between the organism and elements of the environment occurs since the intrauterine period. This interaction associated with variations in tone favor the baby's representation of movement. Borghini, 2015 reports the importance of tonic dialogue during the first weeks of life as a crucial opportunity to experience a sense of reassurance with regard to tactile contact. In our studies we investigated the strategy of back and foot support and suggest it for use in clinical, home, hospital and educational practice because it favors learning and the entry of sensory responses contributing to the child's development.

Há muito tempo ficou estabelecido que os neonatos e lactentes com audição normal entre as idades de 4 e 16 meses passam por um amadurecimento e um desenvolvimento ordenados dos comportamentos de respostas auditivas previsíveis. Nas mãos de um fonoaudiólogo experiente, o conhecimento das repostas comportamentais auditivas normais pode ser usado como um processo de triagem da audição. O lactente em alerta, com audição normal, responderá de maneira prevista de acordo com sua idade. É observado que pelo menos, 95% de bebês com audição normal demonstrarão as respostas de maturação auditiva (Northern e Downs, 2002).

Enquanto você está lendo este artigo, seus olhos se movem (Kooiker et al., 2016). Quando um som alto nos alerta para uma situação potencialmente perigosa, nossos olhos se orientam para a fonte desse som para obter mais conhecimento de sua identidade. Os sistemas auditivos e visuais estão intimamente ligados (Braga et al.,2016). O processamento de informações visuais e auditivas resulta de uma rede elaborada localizada nos olhos, ouvidos e cérebro.

Em nosso **primeiro** artigo, *Estudo das respostas sensoriais e auditivas visuais em bebês de 6 a 15 meses com e sem apoio dorsal e plantar* avaliamos as respostas sensoriais auditivas (usando a Avaliação do Comportamento Auditivo) e visual (teste de detecção LEA GRATINGS) em 70 crianças com 6-15 meses com e sem apoio dorsal e plantar. Como resultado, foi encontrada significância estatística nas variáveis auditivas. Comparando a mediana dos testes visuais e auditivos entre as categorias com e sem apoio encontramos significância clínica.

Em nosso **segundo** artigo, *Resposta de orientação e fixação visual a experimentos visuais em crianças: uso do apoio dorsal e plantar* relatamos os efeitos do apoio dorsal e plantar na entrada sensorial visual durante tarefas visuais. Realizamos duas tarefas visuais em duas amostras diferentes. No experimento 1, usamos o teste visual de detecção de LEA GRATINGS em 10 bebês de 6 a 15 meses e no experimento 2, investigamos a duração da fixação ocular em 10 crianças de 2 a 5 anos com desordem do espectro autista usando *eye tracking.* De acordo com nossos resultados, não foi encontrada diferença significativa na duração da fixação ocular nos estímulos visuais e na resposta de latência do teste de detecção visual com e sem apoio dorsal e plantar. No entanto, descobrimos que dos 10 lactentes avaliados em 6, a latência média de resposta com apoio dorsal e plantar foi menor, o que mostra um significado clínico. Resultado semelhante foi encontrado em relação à média da duração da fixação ocular de estímulos visuais com e sem apoio dorsal e plantar no autismo.

Em nosso **terceiro** estudo *Looking at foot support in infant: Pilot Project* $_a$ *and Looking at back and foot support in adults: Pilot Project* $_b$ propusemos testar a estratégia de apoio plantar com lactentes e a estratégia de apoio dorsal e plantar com adultos. Realizamos um estudo com oito crianças de 8 a 13 meses e oito adultos de 29 a 35 anos que foram testados auditivamente e visualmente. Como resultado, de acordo com os resultados auditivos, três bebês apresentaram resposta de latência menor com apoio dorsal e plantar e no teste visual, dois bebês apresentaram resposta de menor latência com apoio dorsal e plantar. De acordo com os resultados dos testes auditivos e visuais, 2 adultos apresentaram resposta de menor latência com apoio dorsal e plantar,

1 adulto não foi encontrada diferença e 1 apresentou resposta de latência menor sem apoio.

A capacidade de integrar informações auditivas e visuais é fundamental para criar uma percepção unificada do mundo (Nichols, Grahn, 2016). A experiência audiovisual precoce pode ser importante para o desenvolvimento normal da percepção da fala (Bergeson et al., 2010). Nos lactentes, como em um dos nossos estudos, a melhoria na resposta visual favorece as relações interpessoais contribuindo para o desenvolvimento da linguagem. Nos autistas em nosso estudo por exemplo, um aumento na atenção visual é importante, pois uma das características clínicas mais proeminentes no autismo é a diminuição ou ausência de contato visual.

O desenvolvimento perceptivo exige que os bebês adaptem seu sistema perceptivo às estruturas e informações estatísticas de seu ambiente (Emberson,2017). A interação entre o organismo e elementos do ambiente ocorre desde o período intrauterino. Essa interação associada às variações de tônus favorecem ao bebê a representações do movimento. Borghini, 2015 relata a importância do diálogo tônico durante as primeiras semanas de vida como uma oportunidade crucial para experimentar um senso de tranquilidade no que diz respeito ao contato tátil. Em nossos estudos investigamos a estratégia do apoio dorsal e plantar e a sugerimos para uso na prática clínica, domiciliar, hospitalar e educacional pois favorece a aprendizagem e a entrada de respostas sensoriais contribuindo para o desenvolvimento da criança.

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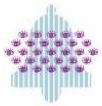


APPENDICE

ANNEX

Appendices- Appendice 1

Termo de Consentimento Livre e Esclarecido

TÍTULO: Estudo das respostas sensoriais auditiva e visual em bebês de 6 a 15 meses com e sem apoio dorsal e plantar

Pesquisadores responsáveis: Erika Maria Parlato de Oliveira e Isabella Marques Pereira Rahme

Seu filho(a) está sendo convidado(a) a participar do estudo intitulado: Estudo das respostas sensoriais auditiva e visual em bebês de 6 a 15 meses com e sem apoio dorsal e plantar

É importante que você leia com atenção o texto abaixo e esclareça suas dúvidas.

Sua participação constará inicialmente de um contato, com a pesquisadora Fga. Isabella Marques Pereira Rahme onde serão esclarecidas todas as dúvidas pertinentes ao projeto. Logo este procedimento, a pesquisa iniciará. O objetivo da realização deste estudo é avaliar as respostas sensoriais auditivas e visuais em bebês de 6 a 15 meses com e sem o apoio dorsal e plantar. O estudo das respostas sensoriais auditiva e visual será conduzido através da triagem auditiva e visual.

Em relação a triagem auditiva será feita a avaliação do comportamento auditivo que é um procedimento subjetivo que pode ser realizado em qualquer criança de 0 a 24 meses de idade. Nesta técnica o profissional apresenta algum tipo de estímulo auditivo na orelha direita ou esquerda (guizo, sino), e observa a resposta da criança à presença do som. Tal resposta é interpretada pelo profissional como a criança "ouvindo" o estímulo. Em relação a triagem visual uma estimativa da função de algumas partes das vias visuais pode ser feita usando medições de acuidade visual com testes de detecção e discriminação. Em nossa pesquisa utilizaremos o LEA GRATINGS que é um teste de detecção de fácil aplicabilidade. No teste o bebê detecta a presença de linhas paralelas de largura decrescente através do uso de pás. As avaliações auditiva e visual serão conduzidas em estado de alerta do bebê que estará sentado no colo materno/cuidador.

Caso haja suspeita de alteração auditiva e visual serão feitos os encaminhamentos necessários para o Ambulatório de Otorrinolaringologia e de Oftalmologia do Hospital São Geraldo-Hospital das Clínicas.

A coleta será realizada no laboratório de bebês denominado *babylab* da Faculdade de Medicina da Universidade Federal de Minas Gerais e terá duração aproximada de 30 minutos com cada bebê em um único encontro.

Para participar deste estudo o Sr. (a) não terá nenhum custo nem receberá qualquer vantagem financeira. Caso haja qualquer despesa adicional, a mesma será coberta pelo orçamento da pesquisa. O Sr. (a) terá o esclarecimento sobre o estudo em qualquer aspecto que desejar e estará livre para participar ou recusar-se a participar e a qualquer tempo e sem quaisquer

prejuízos. A sua participação é voluntária, e a recusa em participar não acarretará qualquer penalidade ou modificação na forma em que o Sr. (a) é atendido (a) pelo pesquisador.

Os resultados deste projeto serão apresentados como Tese de Doutorado do Programa de Pós Graduação em Saúde da Criança e do Adolescente, da Faculdade de Medicina da Universidade Federal de Minas Gerais.

Este termo de consentimento encontra-se impresso em duas vias originais, sendo que uma será arquivada pelo pesquisador responsável e a outra será fornecida ao Sr. (a). Os dados, materiais e instrumentos utilizados na pesquisa ficarão arquivados com o pesquisador responsável por um período de 5 (cinco) anos na sala 291 da Faculdade de Medicina da UFMG e após esse tempo serão destruídos. Os pesquisadores tratarão a sua identidade com padrões profissionais de sigilo, atendendo a legislação brasileira (Resoluções Nº466/12; 441/11 e a Portaria 2.201 do Conselho Nacional de Saúde e suas complementares), utilizando as informações somente para fins acadêmicos e científicos.

Consentimento:

Eu _____mãe (ou responsável), RG/CPF _____ do bebê_____ fui informado (a) dos objetivos, métodos, riscos e benefícios da pesquisa "Estudo das respostas sensoriais auditiva e visual em bebês de 6 a 15 meses com e sem apoio dorsal" de maneira clara e detalhada e esclareci minhas dúvidas. Sei que a qualquer momento poderei solicitar novas informações e modificar minha decisão de participar se assim o desejar.

Rubrica do pesquisador: _____

Rubrica do responsável pelo participante: _____

Declaro que concordo em participar desta pesquisa. Recebi uma via original deste termo de consentimento livre e esclarecido assinado por mim e pelo pesquisador, que me deu a oportunidade de ler e esclarecer todas as minhas dúvidas.

_____

Nome completo do participante Data

_____

Assinatura do participante

Appendices- Appendice 2

Termo de Consentimento Livre e Esclarecido

TÍTULO: Resposta de orientação e fixação visual a experimentos visuais em crianças: uso do apoio dorsal e plantar

Pesquisadores responsáveis: Erika Maria Parlato de Oliveira e Isabella Marques Pereira Rahme

Seu filho(a) está sendo convidado(a) a participar do estudo intitulado: Resposta de orientação e fixação visual a experimentos visuais em crianças: uso do apoio dorsal e plantar

É importante que você leia com atenção o texto abaixo e esclareça suas dúvidas.

Sua participação constará inicialmente de um contato, com a pesquisadora Fga. Isabella Marques Pereira Rahme onde serão esclarecidas todas as dúvidas pertinentes ao projeto. Logo este procedimento, a pesquisa iniciará. O objetivo da realização deste estudo é avaliar os efeitos do apoio dorsal e plantar na entrada sensorial visual durante tarefas visuais em bebês e crianças.

Em relação a triagem visual em bebês uma estimativa da função de algumas partes das vias visuais pode ser feita usando medições de acuidade visual com testes de detecção e discriminação. Em nossa pesquisa utilizaremos o LEA GRATINGS que é um teste de detecção de fácil aplicabilidade. No teste o bebê detecta a presença de linhas paralelas de largura decrescente através do uso de pás. Em relação a triagem visual em crianças utilizaremos o sistema de rastreamento ocular para investigar a duração da fixação ocular onde estímulos visuais serão demonstrados em uma tela de computador. As avaliações serão conduzidas em estado de alerta do avaliado que estará sentado no colo materno/cuidador no caso de bebês e na cadeira no caso de crianças.

Caso haja suspeita de alteração visual será feito o encaminhamento necessário para o Ambulatório de Oftalmologia do Hospital São Geraldo- Hospital das Clínicas.

A coleta será realizada no laboratório de bebês denominado *babylab* da Faculdade de Medicina da Universidade Federal de Minas Gerais e terá duração aproximada de 30 minutos com cada bebê em um único encontro.

Para participar deste estudo o Sr. (a) não terá nenhum custo nem receberá qualquer vantagem financeira. Caso haja qualquer despesa adicional, a mesma será coberta pelo orçamento da pesquisa. O Sr. (a) terá o esclarecimento sobre o estudo em qualquer aspecto que desejar e estará livre para participar ou recusar-se a participar e a qualquer tempo e sem quaisquer prejuízos. A sua participação é voluntária, e a recusa em participar não acarretará qualquer penalidade ou modificação na forma em que o Sr. (a) é atendido (a) pelo pesquisador.

Os resultados deste projeto serão apresentados como Tese de Doutorado do Programa de Pós Graduação em Saúde da Criança e do Adolescente, da Faculdade de Medicina da Universidade Federal de Minas Gerais.

Este termo de consentimento encontra-se impresso em duas vias originais, sendo que uma será arquivada pelo pesquisador responsável e a outra será fornecida ao Sr. (a). Os dados, materiais e instrumentos utilizados na pesquisa ficarão arquivados com o pesquisador responsável por um período de 5 (cinco) anos na sala 291 da Faculdade de Medicina da UFMG e após esse tempo serão destruídos. Os pesquisadores tratarão a sua identidade com padrões profissionais de sigilo, atendendo a legislação brasileira (Resoluções Nº466/12; 441/11 e a Portaria 2.201 do Conselho Nacional de Saúde e suas complementares), utilizando as informações somente para fins acadêmicos e científicos.

Consentimento:

Eu _____mãe (ou responsável), RG/CPF _____ do bebê/criança_____ fui informado (a) dos objetivos, métodos, riscos e benefícios da pesquisa "Resposta de orientação e fixação visual a experimentos visuais em crianças: uso do apoio dorsal e plantar " de maneira clara e detalhada e esclareci minhas dúvidas. Sei que a qualquer momento poderei solicitar novas informações e modificar minha decisão de participar se assim o desejar.

Rubrica do pesquisador: _____

Rubrica do responsável pelo participante: _____

Declaro que concordo em participar desta pesquisa. Recebi uma via original deste termo de consentimento livre e esclarecido assinado por mim e pelo pesquisador, que me deu a oportunidade de ler e esclarecer todas as minhas dúvidas.

_____

Nome completo do participante Data

_____

Assinatura do participante

Appendices- Appendice 3

Termo de Consentimento Livre e Esclarecido

TÍTULO: Looking at foot support in infant: Pilot Project $_{a}$

Pesquisadores responsáveis: Erika Maria Parlato de Oliveira e Isabella Marques Pereira Rahme

Seu filho(a) está sendo convidado(a) a participar do estudo intitulado: Looking at foot support in infant: Pilot Project $_{a}$

É importante que você leia com atenção o texto abaixo e esclareça suas dúvidas.

Sua participação constará inicialmente de um contato, com a pesquisadora Fga. Isabella Marques Pereira Rahme onde serão esclarecidas todas as dúvidas pertinentes ao projeto. Logo este procedimento, a pesquisa iniciará. O objetivo da realização deste estudo é avaliar os efeitos do apoio plantar nas entradas sensoriais visual e auditiva.

Em relação a triagem auditiva será feita a avaliação do comportamento auditivo que é um procedimento subjetivo que pode ser realizado em qualquer criança de 0 a 24 meses de idade. Nesta técnica o profissional apresenta algum tipo de estímulo auditivo na orelha direita ou esquerda (guizo, sino), e observa a resposta da criança à presença do som. Tal resposta é interpretada pelo profissional como a criança "ouvindo" o estímulo. Em relação a triagem visual uma estimativa da função de algumas partes das vias visuais pode ser feita usando medições de acuidade visual com testes de detecção e discriminação. Em nossa pesquisa utilizaremos o LEA GRATINGS que é um teste de detecção de fácil aplicabilidade. No teste o bebê detecta a presença de linhas paralelas de largura decrescente através do uso de pás. As avaliações serão conduzidas em estado de alerta do avaliado que estará sentado no colo materno/cuidador.

Caso haja suspeita de alteração auditiva e visual serão feitos os encaminhamentos necessários para o Ambulatório de Otorrinolaringologia e de Oftalmologia do Hospital São Geraldo-Hospital das Clínicas.

A coleta será realizada no laboratório de bebês denominado *babylab* da Faculdade de Medicina da Universidade Federal de Minas Gerais e terá duração aproximada de 30 minutos com cada bebê em um único encontro.

Para participar deste estudo o Sr. (a) não terá nenhum custo nem receberá qualquer vantagem financeira. Caso haja qualquer despesa adicional, a mesma será coberta pelo orçamento da pesquisa. O Sr. (a) terá o esclarecimento sobre o estudo em qualquer aspecto que desejar e estará livre para participar ou recusar-se a participar e a qualquer tempo e sem quaisquer prejuízos. A sua participação é voluntária, e a recusa em participar não acarretará qualquer penalidade ou modificação na forma em que o Sr. (a) é atendido (a) pelo pesquisador.

Os resultados deste projeto serão apresentados como Tese de Doutorado do Programa de Pós Graduação em Saúde da Criança e do Adolescente, da Faculdade de Medicina da Universidade Federal de Minas Gerais.

Este termo de consentimento encontra-se impresso em duas vias originais, sendo que uma será arquivada pelo pesquisador responsável e a outra será fornecida ao Sr. (a). Os dados, materiais e instrumentos utilizados na pesquisa ficarão arquivados com o pesquisador responsável por um período de 5 (cinco) anos na sala 291 da Faculdade de Medicina da UFMG e após esse tempo serão destruídos. Os pesquisadores tratarão a sua identidade com padrões profissionais de sigilo, atendendo a legislação brasileira (Resoluções Nº466/12; 441/11 e a Portaria 2.201 do Conselho Nacional de Saúde e suas complementares), utilizando as informações somente para fins acadêmicos e científicos.

Consentimento:

Eu _____mãe (ou responsável), RG/CPF _____ do bebê_____ fui informado (a) dos objetivos, métodos, riscos e benefícios da pesquisa "Looking at foot support in infant: Pilot Project $_{a}$" de maneira clara e detalhada e esclareci minhas dúvidas. Sei que a qualquer momento poderei solicitar novas informações e modificar minha decisão de participar se assim o desejar.

Rubrica do pesquisador: _____

Rubrica do responsável pelo participante: _____

Declaro que concordo em participar desta pesquisa. Recebi uma via original deste termo de consentimento livre e esclarecido assinado por mim e pelo pesquisador, que me deu a oportunidade de ler e esclarecer todas as minhas dúvidas.

_____

Nome completo do participante Data

_____

Assinatura do participante

Appendices- Appendice 4

Termo de Consentimento Livre e Esclarecido

TÍTULO: Looking at back and foot support in adults: Pilot Project $_b$

Pesquisadores responsáveis: Erika Maria Parlato de Oliveira e Isabella Marques Pereira Rahme

Seu filho(a) está sendo convidado(a) a participar do estudo intitulado: Looking at back and foot support in adults: Pilot Project $_b$

É importante que você leia com atenção o texto abaixo e esclareça suas dúvidas.

Sua participação constará inicialmente de um contato, com a pesquisadora Fga. Isabella Marques Pereira Rahme onde serão esclarecidas todas as dúvidas pertinentes ao projeto. Logo este procedimento, a pesquisa iniciará. O objetivo da realização deste estudo é avaliar os efeitos do apoio dorsal e plantar nas entradas sensoriais visual e auditiva.

Em relação a avaliação auditiva será feita a Audiometria de Altas Frequencias, exame indolor, onde será feito a mensuração da função coclear das frequências auditivas acima de 8000Hz. O avaliado entrará dentro da cabina audiométrica e através da utilização de fones auriculares sera feita a mensuração auditiva. Em relação a triagem visual uma estimativa da função de algumas partes das vias visuais pode ser feita usando medições de acuidade visual com testes de detecção e discriminação. Em nossa pesquisa utilizaremos o LEA GRATINGS que é um teste de detecção de fácil aplicabilidade. As avaliações serão conduzidas em estado de alerta do avaliado que estará sentado em uma cadeira.

Caso haja suspeita de alteração auditiva e visual serão feitos os encaminhamentos necessários para o Ambulatório de Otorrinolaringologia e de Oftalmologia do Hospital São Geraldo-Hospital das Clínicas.

A coleta será realizada no laboratório de bebês denominado *babylab* da Faculdade de Medicina da Universidade Federal de Minas Gerais e terá duração aproximada de 30 minutos com cada bebê em um único encontro.

Para participar deste estudo o Sr. (a) não terá nenhum custo nem receberá qualquer vantagem financeira. Caso haja qualquer despesa adicional, a mesma será coberta pelo orçamento da pesquisa. O Sr. (a) terá o esclarecimento sobre o estudo em qualquer aspecto que desejar e estará livre para participar ou recusar-se a participar e a qualquer tempo e sem quaisquer prejuízos. A sua participação é voluntária, e a recusa em participar não acarretará qualquer penalidade ou modificação na forma em que o Sr. (a) é atendido (a) pelo pesquisador.

Os resultados deste projeto serão apresentados como Tese de Doutorado do Programa de Pós Graduação em Saúde da Criança e do Adolescente, da Faculdade de Medicina da Universidade Federal de Minas Gerais.

Este termo de consentimento encontra-se impresso em duas vias originais, sendo que uma será arquivada pelo pesquisador responsável e a outra será fornecida ao Sr. (a). Os dados, materiais e instrumentos utilizados na pesquisa ficarão arquivados com o pesquisador responsável por um período de 5 (cinco) anos na sala 291 da Faculdade de Medicina da UFMG e após esse tempo serão destruídos. Os pesquisadores tratarão a sua identidade com padrões profissionais de sigilo, atendendo a legislação brasileira (Resoluções Nº466/12; 441/11 e a Portaria 2.201 do Conselho Nacional de Saúde e suas complementares), utilizando as informações somente para fins acadêmicos e científicos.

Consentimento:

Eu _____ RG/CPF _____ fui informado (a) dos objetivos, métodos, riscos e benefícios da pesquisa "Looking at back and foot support in adults: Pilot Project $_{b}$" de maneira clara e detalhada e esclareci minhas dúvidas. Sei que a qualquer momento poderei solicitar novas informações e modificar minha decisão de participar se assim o desejar.

Rubrica do pesquisador: _____

Rubrica do participante: _____

Declaro que concordo em participar desta pesquisa. Recebi uma via original deste termo de consentimento livre e esclarecido assinado por mim e pelo pesquisador, que me deu a oportunidade de ler e esclarecer todas as minhas dúvidas.

_____

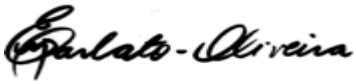
Nome completo do participante Data

_____

Assinatura do participante

Esta é a última página dos Termos de Consentimento.

Nome completo do pesquisador responsável: Erika Maria Parlato-Oliveira
Endereço: Avenida Prof. Alfredo Balena, 190- Santa Efigênia, Belo Horizonte-MG 30310-100
Telefones: +33 6 47458982
Email: eparlato@hotmail.com



Assinatura do pesquisador responsável Data

Nome completo do pesquisador: Isabella Marques Pereira Rahme
Endereço: Avenida Prof. Alfredo Balena, 190- Santa Efigênia, Belo Horizonte-MG 30310-100
Telefones: (031) 99633-1759
Email: isa_marquess@hotmail.com

Assinatura do pesquisador Data

Em caso de dúvidas, com respeito aos aspectos éticos desta pesquisa, você poderá consultar:

COEP-UFMG - Comissão de Ética em Pesquisa da UFMG
Av. Antônio Carlos, 6627. Unidade Administrativa II - 2º andar - Sala 2005.
Campus Pampulha. Belo Horizonte, MG – Brasil. CEP: 31270-901.
E-mail: coep@prpq.ufmg.br . Tel: 34094592

Appendices- Appendice 5

Informed Consent Form

TITLE: Study of auditory and visual sensory responses in infants aged 6 to 15 months with and without back and foot support

Responsible researchers: Erika M Parlato-Oliveira and Isabella Marques Pereira Rahme

Your child is being invited to participate in the study entitled: Study of auditory and visual sensory responses in infants aged 6 to 15 months with and without back and foot support

It is important that you carefully read the text below and clarify your doubts.

Your participation will initially consist of a contact, with the researcher Fga. Isabella Marques Pereira Rahme where all the questions related to the project will be clarified. After this procedure, the research will start. The objective of this study is to evaluate the auditory and visual sensory responses in infants aged 6 to 15 months with and without back and foot support. The study of auditory and visual sensory responses will be conducted through auditory and visual screening.

In relation to hearing screening, auditory behavior will be assessed, which is a subjective procedure that can be performed on any child from 0 to 24 months of age. In this technique, the professional presents some type of auditory stimulus in the right or left ear (guizo, bell) and observes the child's response to the presence of sound. Such response is interpreted by the professional as the child “listening” to the stimulus. In relation to visual screening, an estimate of the function of some parts of the visual pathways can be made using visual acuity measurements with detection and discrimination tests. In our research we will use LEA GRATINGS which is a detection test that is easy to apply. In the test the baby detects the presence of parallel lines of decreasing width through the use of paddles. The auditory and visual assessments will be conducted in an alert state of the baby who will be sitting on the mother's / caregiver's lap.

If there is suspicion of hearing and visual impairment, the necessary referrals will be made to the Otorhinolaryngology and Ophthalmology Department from Hospital São Geraldo - Hospital das Clínicas.

The data will be carried out in the baby laboratory called *babylab* of the Faculty of Medicine of the Federal University of Minas Gerais and will last approximately 30 minutes with each baby in a single meeting.

To participate in this study, you will have no cost or receive any financial advantage. If there is any additional expense, it will be covered by the research budget. You will have clarification about the study in any aspect you wish and will be free to participate or refuse to participate at any time without any losses. Your participation is voluntary, and the refusal

to participate will not entail any penalty or change in the way in which you are treated by the researcher.

The results of this project will be presented as a Doctoral Thesis of the Postgraduate Program in Child and Adolescent Health, from the Faculty of Medicine of the Federal University of Minas Gerais.

This consent form is printed in two original copies, one of which will be filed by the responsible researcher and the other will be provided to you. The data, materials and instruments used in the research will be filed with the researcher responsible for a period of 5 (five) years in room 291 of the UFMG School of Medicine and after that time they will be destroyed. Researchers will treat their identity with professional standards of confidentiality, complying with Brazilian legislation (Resolutions No. 466/12; 441/11 and Ordinance 2.201 of the National Health Council and its complementaries), using the information only for academic and scientific purposes.

Consent:

I _____mother (or responsable), ID from baby _____ was informed of the objectives, methods, risks and benefits of the research "Study of auditory and visual sensory responses in infants aged 6 to 15 months with and without back and foot support" in a clear and detailed way and clarified my doubts. I know that at any time I will be able to request new information and modify my decision to participate if I so wish.

Researcher rubric: _____

Rubric of the person responsible for the participant: _____

I declare that I agree to participate in this research. I received an original copy of this informed consent form signed by me and the researcher, which gave me the opportunity to read and clarify all my doubts.

_____

Full name of the participant Date

_____

Participant's signature

Appendices- Appendice 6

Informed Consent Form

TITLE: Orientation and fixation visual response to visual experiments in children: use of back and foot support

Responsible researchers: Erika M Parlato-Oliveira and Isabella Marques Pereira Rahme

Your child is being invited to participate in the study entitled: Orientation and fixation visual response to visual experiments in children: use of back and foot support

It is important that you carefully read the text below and clarify your doubts.

Your participation will initially consist of a contact, with the researcher Fga. Isabella Marques Pereira Rahme where all the questions related to the project will be clarified. After this procedure, the research will start. The objective of this study is to evaluate the effects of back and foot support on visual sensory input during visual tasks in babies and children.

In relation to visual screening in babies, an estimate of the function of some parts of the visual pathways can be made using visual acuity measurements with detection and discrimination tests. In our research we will use LEA GRATINGS which is a detection test that is easy to apply. In the test the baby detects the presence of parallel lines of decreasing width through the use of paddles. Regarding visual screening in children we will use the eye tracking system to investigate the duration of eye fixation where visual stimuli will be demonstrated on a computer screen. The assessments will be conducted in an alert state of the evaluated who will be sitting on the mother's / caregiver's lap in the case of babies and in the chair in the case of children.

If there is suspicion of visual impairment, the necessary referrals will be made to the Ophthalmology Department from Hospital São Geraldo - Hospital das Clínicas.

The data will be carried out in the baby laboratory called *babylab* of the Faculty of Medicine of the Federal University of Minas Gerais and will last approximately 30 minutes with each baby in a single meeting.

To participate in this study, you will have no cost or receive any financial advantage. If there is any additional expense, it will be covered by the research budget. You will have clarification about the study in any aspect you wish and will be free to participate or refuse to participate at any time without any losses. Your participation is voluntary, and the refusal to participate will not entail any penalty or change in the way in which you are treated by the researcher.

The results of this project will be presented as a Doctoral Thesis of the Postgraduate Program in Child and Adolescent Health, from the Faculty of Medicine of the Federal University of Minas Gerais.

This consent form is printed in two original copies, one of which will be filed by the responsible researcher and the other will be provided to you. The data, materials and instruments used in the research will be filed with the researcher responsible for a period of 5 (five) years in room 291 of the UFMG School of Medicine and after that time they will be destroyed. Researchers will treat their identity with professional standards of confidentiality, complying with Brazilian legislation (Resolutions No. 466/12; 441/11 and Ordinance 2.201 of the National Health Council and its complementaries), using the information only for academic and scientific purposes.

Consent:

I _____mother (or responsable), ID from baby/children _____ was informed of the objectives, methods, risks and benefits of the research "Orientation and fixation visual response to visual experiments in children: use of back and foot support" in a clear and detailed way and clarified my doubts. I know that at any time I will be able to request new information and modify my decision to participate if I so wish.

Researcher rubric: _____

Rubric of the person responsible for the participant: _____

I declare that I agree to participate in this research. I received an original copy of this informed consent form signed by me and the researcher, which gave me the opportunity to read and clarify all my doubts.

_____

Full name of the participant Date

_____

Participant's signature

Appendices- Appendice 7

Informed Consent Form

TITLE: Looking at foot support in infant: Pilot Project a

Responsible researchers: Erika M Parlato-Oliveira and Isabella Marques Pereira Rahme

Your child is being invited to participate in the study entitled: Looking at foot support in infant: Pilot Project a

It is important that you carefully read the text below and clarify your doubts.

Your participation will initially consist of a contact, with the researcher Fga. Isabella Marques Pereira Rahme where all the questions related to the project will be clarified. After this procedure, the research will start. The aim of this study is to evaluate the effects of foot support on visual and auditory sensory inputs.

In relation to hearing screening, auditory behavior will be assessed, which is a subjective procedure that can be performed on any child from 0 to 24 months of age. In this technique, the professional presents some type of auditory stimulus in the right or left ear (guizo, bell) and observes the child's response to the presence of sound. Such response is interpreted by the professional as the child "listening" to the stimulus. In relation to visual screening, an estimate of the function of some parts of the visual pathways can be made using visual acuity measurements with detection and discrimination tests. In our research we will use LEA GRATINGS which is a detection test that is easy to apply. In the test the baby detects the presence of parallel lines of decreasing width through the use of paddles. The assessments will be conducted in an alert state of the baby who will be sitting on the mother's / caregiver's lap.

If there is suspicion of hearing and visual impairment, the necessary referrals will be made to the Otorhinolaryngology and Ophthalmology Department from Hospital São Geraldo - Hospital das Clínicas.

The data will be carried out in the baby laboratory called *babylab* of the Faculty of Medicine of the Federal University of Minas Gerais and will last approximately 30 minutes with each baby in a single meeting.

To participate in this study, you will have no cost or receive any financial advantage. If there is any additional expense, it will be covered by the research budget. You will have clarification about the study in any aspect you wish and will be free to participate or refuse to participate at any time without any losses. Your participation is voluntary, and the refusal to participate will not entail any penalty or change in the way in which you are treated by the researcher.

The results of this project will be presented as a Doctoral Thesis of the Postgraduate Program in Child and Adolescent Health, from the Faculty of Medicine of the Federal University of Minas Gerais.

This consent form is printed in two original copies, one of which will be filed by the responsible researcher and the other will be provided to you. The data, materials and instruments used in the research will be filed with the researcher responsible for a period of 5 (five) years in room 291 of the UFMG School of Medicine and after that time they will be destroyed. Researchers will treat their identity with professional standards of confidentiality, complying with Brazilian legislation (Resolutions No. 466/12; 441/11 and Ordinance 2.201 of the National Health Council and its complementaries), using the information only for academic and scientific purposes.

Consent:

I _____mother (or responsable), ID from baby _____ was informed of the objectives, methods, risks and benefits of the research "Looking at foot support in infant: Pilot Project $_a$" in a clear and detailed way and clarified my doubts. I know that at any time I will be able to request new information and modify my decision to participate if I so wish.

Researcher rubric: _____

Rubric of the person responsible for the participant: _____

I declare that I agree to participate in this research. I received an original copy of this informed consent form signed by me and the researcher, which gave me the opportunity to read and clarify all my doubts.

_____

Full name of the participant Date

_____

Participant's signature

Appendices- Appendice 8

Informed Consent Form

TITLE: Looking at back and foot support in adults: Pilot Project $_b$

Responsible researchers: Erika M Parlato-Oliveira and Isabella Marques Pereira Rahme

Your child is being invited to participate in the study entitled: Looking at back and foot support in adults: Pilot Project $_b$

It is important that you carefully read the text below and clarify your doubts.

Your participation will initially consist of a contact, with the researcher Fga. Isabella Marques Pereira Rahme where all the questions related to the project will be clarified. After this procedure, the research will start. The aim of this study is to evaluate the effects of back and foot support on visual and auditory sensory inputs.

Regarding the auditory evaluation will be performed the Audiometry of High Frequencies, painless examination, where the cochlear function of auditory frequencies above 8000Hz will be measured. The evaluated will enter the audiometric cabine and through the use of ear phones the hearing measurement will be performed. In relation to visual screening, an estimate of the function of some parts of the visual pathways can be made using visual acuity measurements with detection and discrimination tests. In our research we will use LEA GRATINGS which is a detection test that is easy to apply. The assessments will be conducted in an alert state of the evaluater who will be sitting in a chair.

If there is suspicion of hearing and visual impairment, the necessary referrals will be made to the Otorhinolaryngology and Ophthalmology Department from Hospital São Geraldo - Hospital das Clínicas.

The data will be carried out in the baby laboratory called *babylab* of the Faculty of Medicine of the Federal University of Minas Gerais and will last approximately 30 minutes with each baby in a single meeting.

To participate in this study, you will have no cost or receive any financial advantage. If there is any additional expense, it will be covered by the research budget. You will have clarification about the study in any aspect you wish and will be free to participate or refuse to participate at any time without any losses. Your participation is voluntary, and the refusal to participate will not entail any penalty or change in the way in which you are treated by the researcher.

The results of this project will be presented as a Doctoral Thesis of the Postgraduate Program in Child and Adolescent Health, from the Faculty of Medicine of the Federal University of Minas Gerais.

This consent form is printed in two original copies, one of which will be filed by the responsible researcher and the other will be provided to you. The data, materials and

instruments used in the research will be filed with the researcher responsible for a period of 5 (five) years in room 291 of the UFMG School of Medicine and after that time they will be destroyed. Researchers will treat their identity with professional standards of confidentiality, complying with Brazilian legislation (Resolutions No. 466/12; 441/11 and Ordinance 2.201 of the National Health Council and its complementaries), using the information only for academic and scientific purposes.

Consent:

I _____ID _____ was informed of the objectives, methods, risks and benefits of the research "Looking at back and foot support in adults: Pilot Project $_b$ in a clear and detailed way and clarified my doubts. I know that at any time I will be able to request new information and modify my decision to participate if I so wish.

Researcher rubric: _____

Rubric for the participant: _____

I declare that I agree to participate in this research. I received an original copy of this informed consent form signed by me and the researcher, which gave me the opportunity to read and clarify all my doubts.

_____

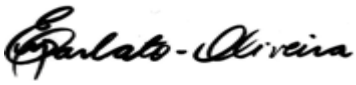
Full name of the participant Date

_____

Participant's signature

This is the last page of the Consent Terms.

Full name of the responsible researcher: Erika Maria Parlato-Oliveira
Address: Avenida Prof. Alfredo Balena, 190- Santa Efigênia, Belo Horizonte-MG 30310-100
Telephones: +33 6 47458982
Email: eparlato@hotmail.com



Signature of the responsible researcher Date

Researcher's full name: Isabella Marques Pereira Rahme
Address: Avenida Prof. Alfredo Balena, 190- Santa Efigênia, Belo Horizonte-MG 30310-100
Telephones: (031) 99633-1759
Email: isa_marquess@hotmail.com

Signature of the researcher Date

In case of doubts, regarding the ethical aspects of this research, you can consult:
Research Ethics Committee of the Federal University of Minas Gerais
Av. Antônio Carlos, 6627. Unidade Administrativa II - 2º andar - Sala 2005.
Campus Pampulha. Belo Horizonte, MG – Brasil. CEP: 31270-901.
E-mail: coep@prpq.ufmg.br . Tel: 34094592

Annex

Annex 1 Autoridades (Authorities)

Reitora: Prof.a Sandra Regina Goulart Almeida

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Pró-Reitor de Pós-Graduação: Prof. Fabio Alves da Silva Junior

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