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Felipe Colmeneiro dos Santos

REPRODUTIBILIDADE DO TESTE DE SENTAR E LEVANTAR CINCO VEZES EXECUTADO REMOTAMENTE POR PACIENTES COM ESCLEROSE MÚLTIPLA

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Trabalho de Conclusão de Curso apresentado como requisito parcial para obtenção do grau de bacharel em Fisioterapia.

Orientador: Prof. Dr. Luciano Palmeiro Rodrigues
Co-orientadora: Profa. Dra. Cláudia Tarragô Candotti

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RESUMO

Conhecida como a principal causa da incapacidade neurológica não traumática em adultos jovens, a Esclerose Múltipla causa alteração de força muscular, principalmente em Membros Inferiores. A avaliação de força muscular nestes pacientes é imprescindível e pode ser realizada através do Teste de Sentar e Levantar de Cinco Vezes, que comumente é realizado de forma presencial. A partir da pandemia do COVID-19, os fisioterapeutas iniciaram a realização de atendimentos remotos, amparados pela Resolução n° 516/2020 (COFFITO, 2020), a qual permitiu os teleatendimentos no Brasil, criando a necessidade dos fisioterapeutas de realizarem avaliações de forma remota, ao invés de presencial, mesmo sem evidências da confiabilidade de alguns testes, como o Teste de Sentar e Levantar de Cinco Vezes, executado remotamente. Nesse contexto, o objetivo desse estudo foi avaliar a reprodutibilidade intra-avaliador e inter-avaliador do Teste de Sentar e Levantar de Cinco Vezes de maneira remota e síncrona, em pacientes com Esclerose Múltipla para avaliação dos Membros Inferiores. A amostra foi composta por 33 indivíduos com Esclerose Múltipla do tipo surto-remissão (18 femininos e 15 masculinos; 43,7 ± 13,4 anos). As avaliações ocorreram de forma remota e síncrona através de aplicativo de mensagens, por vídeo-chamada. Para avaliar a reprodutibilidade inter-avaliador foi verificado o tempo de execução do Teste de Sentar e Levantar de Cinco Vezes, em segundos, na mesma vídeo-chamada, por dois avaliadores diferentes. Para a avaliação da reprodutibilidade intra-avaliador foram realizadas duas vídeo-chamadas diferentes, pelo mesmo avaliador, com intervalo de 24 a 28 horas. Os dados foram analisados no software SPSS 20.0 por meio de estatística descritiva e inferencial. No que diz respeito à estatística descritiva, foram calculadas médias e desvio padrão. Para análise inferencial da reprodutibilidade intra e interavaliador, foi utilizado o coeficiente de correlação intraclasse (ICC), com o nível de significância de 0,05, o erro padrão de medida (SEM) e a mínima mudança detectável (MDC). Foram encontrados excelentes valores de ICC e baixos valores de SEM e MDC na reprodutibilidade inter-avaliador (ICC: 0,993 (0,986-0,996); valor p: <0,001; SEM: 0,6s; MDC: 1,6s) e intra-avaliador (ICC: 0,962 (0,925-0,981); valor p: <0,001; SEM: 1,4s; MDC: 3,8s). A partir desses valores, considera-se que o Teste de Sentar e Levantar de Cinco Vezes, executado de forma remota e síncrona, em pacientes com Esclerose Múltipla

do tipo surto-remissão, é confiável e reprodutível, podendo ser utilizado tanto por diferentes avaliadores, em serviços prestadores de avaliação, quanto pelo mesmo avaliador, em situações de pré e pós-teste, por exemplo.

Palavras-chave: esclerose múltipla; força muscular; telemonitoramento; telerreabilitação; reprodutibilidade dos testes.

ABSTRACT

Recognized as the main cause of non-traumatic neurological disability in young adults, Multiple Sclerosis causes inclusion of muscle strength, mainly in the lower limbs. Muscle strength in these patients is essential and can be performed through the Five Times Test, which is commonly performed in person. From the COVID-19 pandemic, physical therapists started to carry out remote consultations, supported by n° 516/2020 (COFFITO, 2020), a need to qualify teleservices in Brazil, creating remote physical therapy assistance, instead of face-to-face, even without proof of test reliability, such as Testing and Surveying Five times, proven from some tests. In this context, the aim of this study was to evaluate the intra-rater and inter-rater reproducibility of the Five Times Sit-Up Test remotely and synchronously, in patients with Multiple Sclerosis to assess the Relapse-remitting multiple (18 females and 15 males; 43.7 ± 13.4 years). Remote consultation instructions and the messaging app, by video call. To evaluate the inter-evaluator reproducibility, the time of execution of the Sitting and Standing Five Times, in seconds, in the same video call, by two different evaluators was selected. For the evaluation of intra-evaluator reproducibility, two different calls were made by the same evaluator video, with an interval of 24 to 28 hours. Data were analyzed in SPSS 20.0 software using descriptive and inferential statistics. With regard to descriptive statistics, means and standard deviations were observed. For intra- and inter-assessment reproducibility analysis, the intraclass assessment test (ICC) was used, with a significance level of 0.05, standard error of measurement (SEM) and minimum detectable change (MDC). Excellent ICC values and low SEM and MDC values were found after inter-rater reproducibility (ICC: 0.993 (0.986-0.996); p-value: <0.001; SEM: 0.6s; MDC: 1.6s) and intra-rater (ICC: 0.962 (0.925-0.981); p-value: <0.001; SEM: 1.4s; MDC: 3.8s). Based on these values, it is considered that the Five Times Sit-Up Test, performed remotely and synchronously, in patients with assessment services services, in pre- and post-test situations, for example assessment.

Keywords: multiple sclerosis; muscle strength; telemonitoring; grower rehabilitation; test reproducibility.

SUMÁRIO

1 APRESENTAÇÃO

O presente estudo foi elaborado nos anos de 2020 e 2021, pois com a pandemia da COVID-19, os acompanhamentos fisioterapêuticos do grupo de caminhada, do projeto de extensão "Orientação de caminhada e exercícios para portadores de Esclerose Múltipla", coordenado pelo professor Luciano Palmeiro, do qual faço parte, tiveram que continuar. Entretanto, no presente momento, até onde tenho conhecimento, a comunidade cientifica ainda carece de informações quanto a confiabilidade das tradicionais escalas e testes de forma remota. Essa realidade afeta diretamente os atendimentos fisioterapêuticos e pesquisas que precisam avaliar o efeito de uma intervenção remota. Foi nesse contexto que surgiu a ideia e a motivação para desenvolver essa pesquisa.

O artigo está formatado nas normas da revista na qual será submetido, a revista *Multiple Sclerosis and Related Disorders* (Fator de Impacto 4,3; Qualis: B1). As normas da revista encontram-se no ANEXO A.

2   ARTIGO COMPLETO

Reprodutibilidade do 'Teste de Sentar e Levantar Cinco Vezes' executado remotamente por pacientes com Esclerose Múltipla

Felipe Colmeneiro dos Santos [a], Cláudia Tarragô Candotti [b], Luciano Palmeiro Rodrigues [c]

[a] Discente do Curso de Fisioterapia da Universidade Federal do Rio Grande do Sul. Escola de Educação Fìsica, Fisioterapia e Dança. Rua Felizardo, 750. Bairro Jardim Botânco. Porto Alegre/ RS – Brasil – CEP 90690-200.
[b] Docente do Curso de Fisioterapia da Universidade Federal do Rio Grande do Sul. Escola de Educação Fìsica, Fisioterapia e Dança. Rua Felizardo, 750. Bairro Jardim Botânco. Porto Alegre/ RS – Brasil – CEP 90690-200.

Autor correspondente: lucianopalmeiro@gmail.com (Luciano Palmeiro Rodrigues)

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RESUMO

Introdução. Conhecida como a principal causa da incapacidade neurológica não traumática em adultos jovens, a Esclerose Múltipla causa alteração de força muscular, principalmente em Membros Inferiores. A avaliação de força muscular nestes pacientes é imprescindível e pode ser realizada através do Teste de Sentar e Levantar de Cinco Vezes, que comumente é realizado de forma presencial. A partir da pandemia do COVID-19, os fisioterapeutas iniciaram a realização de atendimentos remotos, amparados pela Resolução n° 516/2020 (COFFITO, 2020), a qual permitiu os teleatendimentos no Brasil, criando a necessidade dos fisioterapeutas de realizarem avaliações de forma remota, ao invés de presencial, mesmo sem evidências da confiabilidade de alguns testes, como o Teste de Sentar e Levantar de Cinco Vezes. Nesse contexto, o objetivo desse estudo foi avaliar a reprodutibilidade intra-avaliador e inter-avaliador do TSLCV de maneira remota e

síncrona, em pacientes com Esclerose Múltipla. **Métodos.** A amostra foi composta por 33 indivíduos com Esclerose Múltipla do tipo surto-remissão (18 femininos e 15 masculinos; 43,7 ± 13,4 anos). As avaliações ocorreram de forma remota e síncrona através de aplicativo de mensagens, por vídeo-chamada. Para avaliar a reprodutibilidade inter-avaliador foi verificado o tempo de execução do Teste de Sentar e Levantar de Cinco Vezes, em segundos, na mesma vídeo-chamada, por dois avaliadores diferentes. Para a avaliação da reprodutibilidade intra-avaliador foram realizadas duas vídeo-chamadas diferentes, pelo mesmo avaliador, com intervalo de 24 a 28 horas. Os dados foram analisados no software SPSS 20.0 por meio de estatística descritiva e inferencial. No que diz respeito à estatística descritiva, foram calculadas médias e desvio padrão. Para análise inferencial da reprodutibilidade intra e interavaliador, foi utilizado o coeficiente de correlação intraclasse (ICC), com o nível de significância de 0,05, o erro padrão de medida (SEM) e a mínima mudança detectável (MDC). **Resultados.** Foram encontrados excelentes valores de ICC e baixos valores de SEM e MDC na reprodutibilidade inter-avaliador (ICC: 0,993 (0,986-0,996); valor p: <0,001; SEM: 0,6s; MDC: 1,6s) e intra-avaliador (ICC: 0,962 (0,925-0,981); valor p: <0,001; SEM: 1,4s; MDC: 3,8s). **Conclusão.** A partir desses valores, considera-se que o Teste de Sentar e Levantar de Cinco Vezes, executado de forma remota e síncrona, em pacientes com Esclerose Múltipla do tipo surto-remissão, é confiável e reprodutível, podendo ser utilizado tanto por diferentes avaliadores, em serviços prestadores de avaliação, quanto pelo mesmo avaliador, em situações de pré e pós-teste, por exemplo.

Palavras-chave: esclerose múltipla; força muscular; telemonitoramento; telerreabilitação; reprodutibilidade dos testes.

2.1 INTRODUÇÃO

A Esclerose Múltipla (EM) é considerada a principal causa de incapacidade neurológica não traumática de adultos jovens (Browne et al., 2014; Walton et al., 2020). Entre os tipos de EM, a surto-remissão (SR) é a forma mais comum (85% dos casos) (Multiple Sclerosis International Federation, 2013). A força muscular é prejudicada nos pacientes com EM, sendo esse fato mais evidente quando se

solicita uma contração muscular concêntrica rápida, principalmente nos Membros Inferiores (MsIs) (Jørgensen et al., 2017).

A força muscular dos MsIs pode ser mensurada através do Teste de Sentar e Levantar (Silva et al., 2014), que foi elaborado por Csuka & McCarty (1985) e passou por algumas alterações, até culminar no Teste de Sentar e Levantar de Cinco Vezes (TSLCV). Durante a execução do TSLCV os músculos mais ativados, medidos através da ativação muscular média, são tibial anterior e vasto medial do quadríceps, com destaque para reto femoral e solear (Roldán-Jiménez et al., 2015).

Na literatura, além de ocorrer divergência entre as alturas dos assentos, variando desde 43 cm até 46 cm (Kim et al., 2010; Møller et al., 2012; Roldán-Jiménez et al., 2015), também não há consenso sobre o posicionamento dos braços durante a execução do teste. No entanto, há relação significativa entre a altura do assento e o tempo de execução do TSLCV (Ng et al., 2015), e já foi documentado que não há diferença no resultado do teste quando comparado braços cruzados e mãos apoiadas nas coxas (Ng et al., 2013). Assim para realizar um teste confiável, recomenda-se utilizar as mesmas instruções ao repetir o TSLCV com o mesmo paciente (Ng et al., 2015).

No que se refere a confiabilidade do TSLCV, existem evidências de que o teste apresenta alta reprodutibilidade intra e inter-avaliador, quando realizado em paciente com Acidente Vascular Cerebral (AVC) crônico (Mong et al., 2010), com Doença de Parkinson (DP) (Duncan et al., 2011), com dor lombar (Simmonds et al., 1998), em idosos saudáveis (Wallmann et al., 2013) e com EM (Møller et al., 2012).

Devido a pandemia do COVID-19, uma das medidas adotadas para barrar o contágio, foi o isolamento social, medida essa que afetou a vida da população em geral (Chen et al., 2020). Por conta dessa situação, os fisioterapeutas tiveram que realizar atendimentos remotos, amparados pela Resolução n° 516/2020 (BRASIL, 2020), a qual permitiu os teleatendimentos no Brasil a partir de Março de 2020 (Carvalho et al., 2020). Assim, nesse contexto de isolamento social, onde a participação em atividades físicas tendeu a diminuir, e visto que a EM impacta diretamente na redução de força muscular nos MsIs, a qual pode reduzir ainda mais com a restrição dos pacientes aos seus domicílios, surgiu a necessidade dos fisioterapeutas de avaliar de forma remota a força muscular de MsIs.

Não obstante, até onde se tem conhecimento, o tradicional teste TSLCV usado na prática clínica junto aos pacientes com EM, não possui evidências de confiabilidade quando realizado de forma remota. Portanto, o objetivo desse estudo foi avaliar a reprodutibilidade intra-avaliador e inter-avaliador do TSLCV de maneira remota e síncrona, em pacientes com EM, para avaliação da força muscular dos MsIs.

2.2 MÉTODOS

O estudo observacional de confiabilidade, tem delineamento correlacional. A população foi composta por pessoas com EM do tipo SR do estado do Rio Grande do Sul, Brasil. A captação amostral ocorreu na Associação Gaúcha dos Portadores de Esclerose Múltipla (AGAPEM) e junto aos participantes dos projetos de extensão vinculados ao Programa de Reabilitação e Fisioterapia Neurofuncional (REAFIN) do Hospital de Clínicas de Porto Alegre (HCPA).

O cálculo amostral baseou-se no estudo de Walter *et al.* (1998). Para reprodutibilidade inter-avaliador (2 avaliadores) e intra-avaliador (2 avaliações) foi utilizado um nível de significância de 5%, poder de 80%, hipótese nula de ICC de 0,4, levando em consideração que cada indivíduo seria avaliado duas vezes, esperando encontrar um ICC de 0,7, resultando em uma amostra de 33 indivíduos com EM.

Foram incluídos no estudo, pacientes com diagnóstico de EM do tipo SR. Os pacientes classificados com grau 0 na *Funtional Ambulation Category* (FAC); classificados pela Escala Expandida do Estado de Incapacidade de Kurtzke (EDSS) com uma graduação superior a 7,0; os que não realizaram alguma das duas avaliações e os pacientes com alguma alteração musculoesquelética em membros inferiores que interferisse na realização do TSLCV foram excluídos do estudo.

As avaliações foram realizadas apenas após a aprovação do Comitê de Ética e Pesquisa da Universidade Federal do Rio Grande do Sul (UFRGS) (CAAE 57285421.4.0000.5347). Foram respeitadas todas as diretrizes da resolução n° 466/2012 do Conselho Nacional de Saúde sobre ética em pesquisa com seres humanos.

Os pacientes que demonstraram interesse em participar da pesquisa receberam um *link* disponibilizando um formulário do tipo *Google Forms*, contendo:

(1) Termo de Consentimento Livre e Esclarecido (TCLE); (2) breve anamnese; (3) Índice de Barthel (Barros et al., 2009); (4) Escala de Severidade de Fadiga (Toledo et al., 2011); (5) FAC (Elord et al., 2020).

Após o envio dessas informações pelo paciente, era agendada a avaliação remota individual para realização do TSLCV, que ocorreria em dois dias distintos, através de vídeo-chamadas. Para a avaliação remota, dois avaliadores independentes e cegados entre si quanto aos resultados do teste, foram responsáveis por realizar o teste TSLCV: o avaliador 1 (A1) e o avaliador 2 (A2).

Inicialmente era solicitado ao paciente que selecionasse uma cadeira sem braços da sua residência para a realização do teste. Em seguida, era solicitado ao paciente que mensurasse a altura do assento dessa cadeira em relação ao solo. Esta medição era necessária para verificar se a cadeira atendia as especificações para o teste (entre 42 e 46cm de altura em relação ao solo).

Um terceiro pesquisador recebeu os resultados das avaliações imediatamente após o término delas, para organizá-los em planilhas. Com esse procedimento garantiu-se o cegamento entre avaliadores, pois evitou-se que os avaliadores A1 e A2 tivessem qualquer contato com o resultado das avaliações.

As vídeo-chamadas para as avaliações foram realizadas pelo aplicativo de mensagens "*WhatsApp*". A primeira vídeo-chamada foi realizada com a presença dos avaliadores A1, A2 e do paciente. A segunda vídeo-chamada teve a presença apenas do A1 e do paciente e, foi realizada dentro de um intervalo de 24 e 28 horas em relação a primeira vídeo-chamada.

Em ambas vídeo-chamadas, o A1 leu as instruções (Quadro 1) para a realização do teste, e perguntou se havia alguma dúvida a respeito da execução do teste.Após o comando (1, 2, 3, já), o paciente executava o TSLCV pela primeira vez para familiarizar-se. Foi ressaltado que nessa familiarização o paciente não necessitava realizar o teste na maior velocidade para não gerar esforço e interferir na avaliação subsequente. Não houve contagem do tempo na familiarização. Após um intervalo de 1 minuto da familiarização, o A1 dava um novo comando para que o paciente realizasse o TSLCV de forma definitiva. Nesse momento não houve necessidade de nova leitura da instrução.

Quadro 1 – Instrução ao paciente para executar o TSLCV

> Para realizar o teste, você iniciará sentado e vai realizar o ato de levantar e sentar da cadeira 5 vezes, terminado o teste sentado. Durante a execução, você irá esticar bem os joelhos ao ficar em pé, e ao sentar transferir bem o peso para a cadeira, de maneira controlada, ou seja, não se jogue. Realize o teste o mais rápido possível, e não retire o pé do chão com o intuito de se embalar. Não utilize os braços para a execução do teste, assim recomendo cruzar os braços à frente do peito.

Para mensurar o tempo de execução, tanto A1 quanto A2, utilizavam um cronômetro online (http://cronometronline.com.br/). O cronometro era iniciado ao comando do A1 (1, 2, 3, já). Cada avaliador (A1 e A2) deveria parar o cronometro quando o paciente sentava pela quinta e última vez na cadeira, durante a primeira vídeo-chamada.

Na segunda vídeo-chamada, o A1 lia novamente a mesma instrução de realização do teste, antes que o paciente realizasse o TSLCV. Nessa segunda vídeo-chamada não foi realizada familiarização, pressupondo que o paciente já estava familiarizado com o teste. O comando (1, 2, 3, já) para o início do teste foi dado pelo A1, que também cronometrava o tempo de execução do teste.

Por questões éticas, ao final da segunda vídeo-chamada, os pacientes, que não possuíam acompanhamento fisioterapêutico, receberam um folder com orientações para realizar exercícios físicos, conforme o resultado do TSLCV, como benefício de participar da pesquisa. Com isso, os pacientes que apresentaram fraqueza muscular de MsIs receberam orientações de exercícios de força e de alongamentos, enquanto os pacientes que não apresentaram alteração no teste receberam orientação de prática de atividades aeróbicas, visando manter o bom condicionamento.

Os dados coletados nos questionários e os tempos de execução do TSLCV cronometrados pelos A1 e A2, obtidos nos dois momentos de avaliação, foram tabulados no Software Microsoft Excel para análise estatística. A análise estatística foi realizada pelo Software SPSS 20.0 utilizando os procedimentos de estatística descritiva (através de porcentagem, média, moda, mediana e desvio padrão) e inferencial. Em todas as análises foi utilizado o nível de significância de 0,05.

Para comparar os dados obtidos entre os avaliadores e os dados obtidos pelo mesmo avaliador em momentos diferentes foi realizado o teste *T de student* independente e pareado, respectivamente.

Para análise da confiabilidade do TSLCV executado de forma remota, avaliou-se: (1) a reprodutibilidade intra-avaliador, dada pela concordância dos tempos cronometrados pelo A1, obtidos no primeiro e segundo dia de avaliação; e (2) a reprodutibilidade interavaliador, dada pela concordância dos tempos cronometrados pelo A1 e A2, obtidos no primeiro dia de avaliação. Portanto, a fim de avaliar a reprodutibilidade intra e inter-avaliador do TSLCV foi utilizado o Índice de Correlação Intraclasse (ICC) de modelo misto de duas vias, a partir de medidas únicas, para verificar a concordância absoluta (ICC2,1) (Koo and Li, 2016; Shrout e Fleiss, 1979). Os resultados de ICC foram classificados em "fracos" (ICC<0,4), "moderados" (0,4≤ICC<0,75) e "excelentes" (ICC≥0,75) (Shrout and Fleiss, 1979). Ainda, foram calculados: o erro padrão de medida (*standard error of measurement* – SEM); a mínima mudança detectável (*minimal detectable change* – MDC), todos expressos pela unidade de medida testada (no presente estudo, as variáveis contínuas são medidas em segundos). O SEM é a medida da reprodutibilidade absoluta, e expressa a variabilidade ao redor da medida inerente ao erro, calculada pela fórmula SEM=dp √(1-ICC), onde dp é o desvio padrão do conjunto de resultados observados (Bruton et al., 2000). A MDC é considerada a mudança mínima que não se deve à chance de variação da medida, calculada pela fórmula MDC=escore-z ×dp ×√(2(1-ICC)) (Haley and Fragala-Pinkham, 2006).

2.3 RESULTADOS

Foram avaliados 33 indivíduos, 18 do sexo feminino e 15 masculino, com idade média de 43,7±13,4 anos, tempo de diagnóstico 11,1±7,9 anos e moda da EDSS de 1. Todos os pacientes eram independentes para a realização de suas atividades de vida diária, sendo que a maioria relatava fadiga (63,6%). Quanto à deambulação, a maioria dos pacientes que participaram do estudo (73%) eram independentes para deambular em superfícies niveladas e desniveladas segundo a FAC (Tabela 1).

Tabela 1 – Caracterização da Amostra.

Características		n	%	Média (dp)
Gênero	Feminino	18	55%	-
	Masculino	15	45%	-

Idade (anos)		-	-	43,7 (± 13,4)
Tempo de diagnóstico (anos)		-	-	11,1 (± 7,9)
Faz acompanhamento fisioterapêutico?	Sim	7	21%	-
	Não	26	79%	-
Realiza atividade física?	Sim	18	55%	-
	Não	15	45%	-
Índice de Barthel	Totalmente Independente (=100)	15	45%	-
	Independente (>80)	18	55%	-
Escala de severidade da fadiga	Com fadiga (≥28)	21	63,6%	-
	Sem fadiga (<28)	12	36,4%	-
Escala de deambulação funcional	Independente em superfícies niveladas e desniveladas (nível 6)	24	73%	-
	Independente em superfícies de mesmo nível (nível 5)	4	12%	-
	Dependente de supervisão (nível 4)	2	6%	-
	Dependente nível 1 (3)	3	9%	-
Escala Expandida do Estado de Incapacidade*	0	2	6%	-
	1	7	23%	-
	1,5	2	6%	-
	3	6	19%	-
	3,5	7	23%	-
	4	1	3%	-
	4,5	2	6%	-
	5	3	10%	-
	6	1	3%	-
Altura do pé da cadeira	46 cm	10	30%	-
	45 cm	5	15%	-
	44 cm	11	33%	-
	43 cm	2	6%	-
	42 cm	5	15%	-

* 31 Pacientes responderam o questionário quanto a EDSS, 2 pacientes deixaram em branco a resposta.

Em média, na primeira avaliação do A1, os pacientes executaram o TSLCV em 15,0s±7,1s e na primeira avaliação do A2 em 14,9s±6,8s. Na segunda avaliação do A1, o tempo de execução médio foi de 15,4s±7,0s (Tabela 2).

Os excelentes valores de ICC, associados aos baixos valores de SEM e MDC, confirmam a reprodutibilidade inter e intra-avaliador que do TSLCV executado de forma remota (Tabela 2).

Tabela 2 – Resultados da Concordância das Avaliações no TSLCV.

		Média e dp (s)	ICC	ICC 95%	Valor p	SEM (s)	MDC (s)
Inter-avaliador	A1	15,0±7,1	0,993	0,986 - 0,996	<0,001	0,6	1,6
	A2	14,9±6,8					
Intra-avaliador	A1	15,0±7,1	0,962	0, 925 - 0,981	<0,001	1,4	3,8
	A1	15,4±7,0					

2.4 DISCUSSÃO

Este estudo foi o primeiro a investigar a reprodutibilidade do TSLCV, realizado de forma remota e síncrona, com pacientes portadores de EM do tipo SR. Os resultados mostraram excelente confiabilidade intra e interavaliador (Tabela 2), demonstrada pelos altos valores de ICC e baixos valores de SEM e MDC.

Quanto a confiabilidade intra-avaliador do TSLCV, vários estudos demonstraram resultados semelhantes aos nossos, embora tenham sido conduzidos com diferentes tipos de pacientes, diversos tamanhos de cadeiras e diferentes intervalos entre avaliações (Mong *et al.*, 2010; Wang *et al.*, 2012; Paul *et al.,* 2012; Khuna *et al.,* 2019; Van Cappellen-Van Maldegem *et al.,* 2022).

No estudo de Mong *et al.* (2010), os autores testaram a confiabilidade do TSLCV com 8 avaliadores distintos, em uma amostra de 12 participantes com AVC, utilizando uma cadeira de 43 cm de altura e 47,5 cm de profundidade, sem apoio de braços. Nesse estudo, os autores encontraram valor de ICC entre 0,970 (avaliadores F E G) e 0,976 (avaliadores B e C), também demonstrando excelente confiabilidade intra-avaliador do TSLCV, assim como o presente estudo.

Duncan *et al.* (2011), avaliaram 86 indivíduos com Doença de Parkinson (DP) idiopática com mais de 40 anos, com intervalo de uma semana. A altura da cadeira

da cadeira sem apoio de braço era de 43 cm. E mostrou excelente confiabilidade intra-avaliador do TSLCV, embora com valores inferiores de ICC (ICC=0,76). Paul *et al.* (2012), também avaliaram a confiabilidade intra-avaliador do TSLCV em pacientes com DP idiopática (n=31) com 40 anos e capacidade de deambulação independente, com um intervalo de uma semana, e encontraram ICC de 0,97 e SEM de 0,6. Quando avaliaram apenas os pacientes sem discinesia incapacitante (n=25), encontraram ICC de 0,99 e SEM de 0,5, demonstrando excelente confiabilidade do teste nesses pacientes. Com isso, ambos estudos corroboram com o nosso estudo, quanto aos seus resultados, apresentando excelente confiabilidade, porém divergem quanto ao intervalo entre avaliações, de uma semana, ao invés de 24-28 horas, utilizadas no presente estudo.

Wang *et al.* (2012) avaliaram 22 crianças com diplegia espástica, encontrando valor de ICC de 0,99, SEM de 0,02 rep/seg e MDC de 0,06 rep/seg, quando utilizada a média de 3 tentativas e ICC de 0,97, SEM de 0,04 rep/seg e MDC de 0,11 rep/seg, quando utilizada apenas a primeira tentativa. Com base nesses resultados, os autores concluíram que o TSLCV tem excelente confiabilidade intra-avaliador. As principais diferenças do estudo de Wang *et al.* (2012) em relação ao nosso estudo foram as características da cadeira (de altura ajustável para flexão de quadril de 90° e 105° de joelho) e o intervalo entre as avaliações (de dois dias). Apesar disso, o mesmo corrobora com o presente estudo devido ao excelente valor de ICC encontrado.

Resultados semelhantes também foram encontrados por Khuna *et al.* (2019), em 88 participantes ambulatoriais com Lesão Medular, avaliados com uma semana de diferença, alocados em 4 grupos que se diferenciavam pelo posicionamento de braço durante a execução do TSLCV, utilizando uma cadeira padrão sem apoio para os braços, com o paciente posicionado com flexão de quadril de 90° e os pés apoiados no chão com os calcanhares a 10 cm atrás dos joelhos. Os autores encontraram excelentes valores de ICC para cada situação avaliada: braços posicionados sobre um dispositivo de caminhada (n=30), com avaliador experiente (ICC=1,000) e com avaliador iniciante (ICC=0,998); braços posicionados sobre os joelhos (n=21), com avaliador experiente (ICC=0,999) e com avaliador iniciante (ICC=0,999); braços posicionados ao lado do corpo (n=20), com avaliador experiente (ICC=0,999) e com avaliador iniciante (ICC=0,999); braços cruzados à

frente do peito (n=20), com avaliador experiente (ICC=1,000) e com avaliador iniciante (ICC=1,000).

Também quanto a confiabilidade teste-reteste do TSLCV, Khuna *et al.* (2019) encontraram ICC variando de 0,956 a 0,989; SEM variando de 0,55s a 1,09s; e MDC variando de 1,53s a 3,01s, conforme as diferentes situações avaliadas. Os autores concluem que o TSLCV apresenta excelente confiabilidade, independente da experiência de avaliadores, para os quatro posicionamentos diferentes dos braços. Demonstrando, então, resultados que concordam com o presente estudo.

Northgraves *et al.* (2016) avaliaram 35 indivíduos entre 30 e 75 anos, utilizando uma cadeira de plástico de 40 cm de altura e 39 de profundidade, com os braços cruzados à frente do peito. Os resultados mostraram excelente confiabilidade teste-reteste, com ICC de 0,96, SEM de 0,58s, e MDC_{95} de 1,60s. Apesar desses resultados, segundo os próprios autores, houve considerável variabilidade de desempenho individual.

Petersen *et al.* (2017) investigaram a confiabilidade teste-reteste do TSLCV em 22 pessoas com DP, utilizando uma cadeira sem braço de 47,5 cm de altura, com intervalo de 6 a 8 dias entre uma avaliação e outra. Os autores encontraram ICC de 0,74 e MDC_{95} de 10,3s. Apesar da moderada confiabilidade teste-reteste, o MDC_{95} foi muito alto, contrastando com nosso estudo, que encontrou baixo MDC.

No que se refere a confiabilidade inter-avaliador do TSLCV, nossos resultados demonstraram excelente confiabilidade, sendo corroborados por outros estudos (Mong *et al.,* 2010; Duncan *et al.*, 2011; Wang *et al.,* 2012; Khuna *et al.,* 2019).

Mong *et al.* (2010) e Duncan *et al.* (2011) encontraram valores de ICC de 0,99, evidenciando a excelente confiabilidade inter-avaliador do TSLCV. Resultados semelhantes foram encontrados por Wang *et al.* (2012), que avaliaram 108 crianças com diplegia espástica, apresentaram ICC de 0,95, também demonstrando excelente confiabilidade inter-avaliador. No estudo de Khuna *et al.* (2019), os valores de ICC para a confiabilidade inter-avaliador variaram de 0,998 a 1,000, quando avaliadas as quatro diferentes situações de execução do TSLCV: com os braços sobre o dispositivo de marcha, com os braços posicionados sobre os joelhos; com os braços ao lado do corpo; com os braços cruzados a frente do peito.

A excelente reprodutibilidade encontrada em nosso estudo contribui para a prática clínica, quando em certas situações se faz necessário avaliar a força

muscular do paciente de EM do tipo SR de forma remota e síncrona, em uma teleconsulta. Além disso demonstra valores de SEM e MDC, que também trazem contribuições interessantes para a prática clínica. O profissional que irá aplicar o TSLCV em seu paciente, pré e pós-intervenção, deve estar ciente que podem existir diferenças entre os tempos de execução do teste que são referentes ao teste em si, e não as mudanças nas características físicas do paciente. O SEM, é considerado um erro no teste, como por exemplo, um início ou término da contagem no tempo errado ou ainda atrasos devido a velocidade da própria internet. O MDC, que corresponde a mínima mudança detectável no tempo de execução do teste, mostra o valor a partir do qual pode-se atribuir uma mudança de fato na performance do paciente. Por exemplo, imagine um paciente portador de EM do tipo SR que em sua avaliação inicial com aplicação do TSLCV remoto e síncrono, tenha obtido 18s. Após algum tempo de intervenção, esse mesmo paciente é reavaliado, com o mesmo teste e pelo mesmo avaliador, obtendo 10s. A diferença de 8s entre pós e pré-intervenção não significa exatamente uma melhora do paciente, pois como MDC intra-avaliador é de 3,8s, a melhora real do paciente é de 4,2s. Esse tipo de informação ajuda o fisioterapeuta a conhecer de fato o quanto sua intervenção está impactando na melhora do paciente.

Entre as limitações encontradas no presente estudo, podem ser citados os problemas relacionados com a conexão de internet. O aplicativo WhatsApp foi escolhido para realizar as avaliações devido a sua ampla utilização, diminuindo os problemas de manejo por parte dos pacientes. Entretanto, até o momento das avaliações, o aplicativo não disponibilizava chamadas pelo computador. Com isso a conexão de internet era feita através de sinal 3G ao invés de cabo, o que gera instabilidade na conexão. Entendemos que o ideal seria realizar as avaliações através de um aplicativo compatível com microcomputadores, conectando-os à rede através de cabo, tanto o avaliador, quanto o paciente, diminuindo as interferências de sinais nas vídeo-chamadas. Outra limitação encontrada, só que agora referente ao paciente e ao intervalo entre avaliações, foi a sensação de calor. As avaliações ocorreram no verão do Hemisfério Sul, e devido a altas temperaturas existe uma tendência dos pacientes de EM apresentarem maior fadiga e queixas de menor força muscular, podendo influenciar na execução do TSLCV. Quanto a aplicação do TSLCV, outra limitação encontrada foi não existir uma padronização quanto a

característica da cadeira utilizada, podendo ser alta para alguns pacientes, ou baixa para outros pacientes.

2.5   CONCLUSÃO

O Teste de Sentar e Levantar de Cinco Vezes (TSLCV), executado de forma remota e síncrona, em pacientes com esclerose múltipla, é confiável, apresentando excelente reprodutibilidade inter e intra-avaliador, dada a partir dos altos valores de ICC e baixos valores de SEM e MDC.

Financiamento

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3 ANEXOS

3.1 ANEXO A – Normas da revista Multiple Sclerosis and Related Disorders

3.1.1 Description

Multiple Sclerosis is an area of ever expanding research and escalating publications. *Multiple Sclerosis and Related Disorders* is a wide ranging international journal supported by key researchers from all neuroscience domains that focus on MS and associated disease of the **central nervous system**. The primary aim of this new journal is the rapid publication of high quality original research in the field. Important secondary aims will be timely updates and editorials on important scientific and clinical care advances, controversies in the field, and invited opinion articles from current thought leaders on topical issues. One section of the journal will focus on teaching, written to enhance the practice of community and academic neurologists involved in the care of MS patients. Summaries of key articles written for a lay audience will be provided as an on-line resource.

A team of four chief editors is supported by leading section editors who will commission and appraise original and review articles concerning: clinical neurology, neuroimaging, neuropathology, neuroepidemiology, therapeutics, genetics / transcriptomics, experimental models, neuroimmunology, biomarkers, neuropsychology, neurorehabilitation, measurement scales, teaching, neuroethics and lay communication.

The journal will publish the following types of articles: Reviews; Original Research Articles; Editorials; Comment; Clinical Trial papers; Letter to the Editors; Case Reports; Book reviews; News. The submission of an on-line summary of selected papers of relevance for lay audience, Teaching Lessons and supporting images and datasets is also encouraged.

3.1.2 Audience

All branches of neuroscience: clinical neurologists, neurophysiologists, geneticists, psychologist, molecular biologists, MRI and allied imaging specialists, immunologists, major pharmaceutical companies, ethical and legal specialists, MS specialist nurses, drug trial nurses.

3.1.3 Guide for authors

We now differentiate between the requirements for new and revised submissions. You may choose to submit your manuscript as a single Word or PDF file to be used in the refereeing process. Only when your paper is at the revision stage, will you be requested to put your paper in to a 'correct format' for acceptance and provide the items required for the publication of your article. To find out more, please visit the Preparation section below.

3.1.3.1 Introduction

3.1.3.1.1 Types of article

Original Research Articles

Full length research papers will not normally be more than 3500 words in length from the Introduction through the Discussion section and will preferably be shorter. Submission of a paper to Multiple Sclerosis and Related Disorders will be held to imply that it represents original research not previously published (except in the form of an abstract or preliminary report), that it is not being considered for publication elsewhere, and that if accepted by Multiple Sclerosis and Related Disorders it will not be published elsewhere in the same form in any language without the consent of the Publisher. Major papers of topical content will be given priority in publication.

Book Reviews

These are normally submitted by the Book Review Editors, but they welcome suggestions of books for review.

Case Reports

Please note we are no longer accepting case reports as such. These are now incorporated under `Correspondence?. Please refer to the section below

Correspondence

The Editors will consider for publication Correspondence, Editorials, Letters or Short Reports (including Case Reports) that illustrate important points. These should not

exceed 1000 words in length, have a title page, a summary of about 100 words and up to 10 references, one figure and one table. The word length restriction is not rigid and, in the case of Case Reports only, if the authors wish to write a detailed discussion there will be no limit on length unless advised otherwise by the reviewers.

Clinical Trial papers

Manuscripts detailing the results of clinical trials in MS and related disorders are encouraged. The trial methodology should account for all screened participants, and analyses should observe an intentionto-treat model where appropriate. All sources of funding for the study must be disclosed, and the involvement of the study sponsor must be detailed. Clinical trial manuscripts should be a maximum of 3500 words.

Review Articles

Review papers are normally 4000-5000 words in total. Authors are advised to consult one of the Editors with an outline before submitting a review.

3.1.3.1.2 Contact details for submission

Authors may send queries concerning the submission process, manuscript status, or jornal procedures to our Support Centre

3.1.3.1.3 Submission checklist

You can use this list to carry out a final check of your submission before you send it to the journal for review. Please check the relevant section in this Guide for Authors for more details.

Ensure that the following items are present:

One author has been designated as the corresponding author with contact details:
• E-mail address
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All necessary files have been uploaded:

Manuscript:

• Include Keywords

• All figures (include relevant captions)

• All tables (including titles, description, footnotes)

• Ensure all figure and table citations in the text match the files provided

• Indicate clearly if color should be used for any figures in print

Graphical Abstracts / Highlights files (where applicable)

Supplemental files (where applicable)

Further considerations

• Manuscript has been 'spell checked' and 'grammar checked'

• All references mentioned in the Reference List are cited in the text, and vice versa

• Permission has been obtained for use of copyrighted material from other sources (including the Internet)

• A competing interests statement is provided, even if the authors have no competing interests to declare

• Journal policies detailed in this guide have been reviewed

• Referee suggestions and contact details provided, based on journal requirements

For further information, visit our Support Center.

3.1.3.2 Before you begin

3.1.3.2.1 Ethics in publishing

Please see our information on Ethics in publishing.

3.1.3.2.2 Studies in humans and animals

If the work involves the use of human subjects, the author should ensure that the work described has been carried out in accordance with The Code of Ethics of the World Medical Association (Declaration of Helsinki) for experiments involving humans. The manuscript should be in line with the Recommendations for the Conduct, Reporting, Editing and Publication of Scholarly Work in Medical Journals and aim for the inclusion of representative human populations (sex, age and

ethnicity) as per those recommendations. The terms sex and gender should be used correctly.

Authors should include a statement in the manuscript that informed consent was obtained for experimentation with human subjects. The privacy rights of human subjects must always be observed.

All animal experiments should comply with the ARRIVE guidelines and should be carried out in accordance with the U.K. Animals (Scientific Procedures) Act, 1986 and associated guidelines, EU Directive 2010/63/EU for animal experiments, or the National Research Council's Guide for the Care and Use of Laboratory Animals and the authors should clearly indicate in the manuscript that such guidelines have been followed. The sex of animals must be indicated, and where appropriate, the influence (or association) of sex on the results of the study.

Checklist for reporting and reviewing studies of experimental animal models of multiple sclerosis and related disorders The guide, reported here, is intended to act as a checklist to aid both authors and referees of manuscripts, just as the Consolidated Standards of Reporting Trials (CONSORT) guidelines are a compulsory part of reporting clinical trials.

Please click here for the checklist and the complete article by Sandra Amor and David Baker.

3.1.3.2.3 Informed consente and patient details

Studies on patients or volunteers require ethics committee approval and informed consent, which should be documented in the paper. Appropriate consents, permissions and releases must be obtained where an author wishes to include case details or other personal information or images of patients and any other individuals in an Elsevier publication. Written consents must be retained by the author but copies should not be provided to the journal. Only if specifically requested by the journal in exceptional circumstances (for example if a legal issue arises) the author must provide copies of the consents or evidence that such consents have been obtained. For more information, please review the Elsevier Policy on the Use of Images or Personal Information of Patients or other Individuals. Unless you have written permission from the patient (or, where applicable, the next of kin), the personal

details of any patient included in any part of the article and in any supplementary materials (including all illustrations and videos) must be removed before submission.

3.1.3.2.4 Declaration of interest

All authors must disclose any financial and personal relationships with other people or organizations that could inappropriately influence (bias) their work. Examples of potential competing interests include employment, consultancies, stock ownership, honoraria, paid expert testimony, patente applications/registrations, and grants or other funding. Authors must disclose any interests in two places: 1. A summary declaration of interest statement in the title page file (if double anonymized) or the manuscript file (if single anonymized). If there are no interests to declare then please state this: 'Declarations of interest: none'. 2. Detailed disclosures as part of a separate Declaration of Interest form, which forms part of the journal's oficial records. It is important for potential interests to be declared in both places and that the information matches. More information.

3.1.3.2.5 Submission declaration and verification

Submission of an article implies that the work described has not been published previously (except in the form of an abstract, a published lecture or academic thesis, see 'Multiple, redundant or concurrent publication' for more information), that it is not under consideration for publication elsewhere, that its publication is approved by all authors and tacitly or explicitly by the responsible authorities where the work was carried out, and that, if accepted, it will not be published elsewhere in the same form, in English or in any other language, including electronically without the written consent of the copyrightholder. To verify originality, your article may be checked by the originality detection service Crossref Similarity Check.

Preprints

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3.1.3.2.6 Use of inclusive language

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3.1.3.2.7 Author contributions

For transparency, we encourage authors to submit an author statement file outlining their individual contributions to the paper using the relevant CRediT roles: Conceptualization; Data curation; Formal analysis; Funding acquisition; Investigation; Methodology; Project administration; Resources; Software; Supervision; Validation; Visualization; Roles/Writing - original draft; Writing - review & editing. Authorship statements should be formatted with the names of authors first and CRediT role(s) following. More details and an example.

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Authors are expected to consider carefully the list and order of authors **before** submitting their manuscript and provide the definitive list of authors at the time of the original submission. Any addition, deletion or rearrangement of author names in the authorship list should be made Only **before** the manuscript has been accepted and only if approved by the journal Editor. To request such a change, the Editor must

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In line with the position of the International Committee of Medical Journal Editors, the journal will not consider results posted in the same clinical trials registry in which primary registration resides to be prior publication if the results posted are presented in the form of a brief structured (less than 500 words) abstract or table. However, divulging results in other circumstances (e.g., investors' meetings) is discouraged and may jeopardise consideration of the manuscript. Authors should fully disclose all posting in registries of results of the same or closely related work.

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3.1.3.3.4 Revised submissions

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Results should be clear and concise.

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The main conclusions of the study may be presented in a short Conclusions section, which may stand alone or form a subsection of a Discussion or Results and Discussion section.

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A structured abstract that includes the headings: Background, Methods, Results, and Conclusion is required. The abstract must not exceed 500 words. **Background.** The background should provide a brief and concise description of the background and

reason for the study citing relevant literature overview, and a clear statement of hypothesis, and study objectives. The introduction should not be an exhaustive review of the literature. **Methods.** This section provides a concise description of the procedural, experimental, and statistical methods in sufficient detail to allow other investigators to reproduce the study. **Results.** State concisely the results of the study. **Conclusion.** Briefly summarize the major conclusions of the investigation.

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Reference to a book: Strunk Jr., W., White, E.B., 2000. The Elements of Style, fourth ed. Longman, New York.

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Cancer Research UK, 1975. Cancer statistics reports for the UK. http://www.cancerresearchuk.org/aboutcancer/statistics/cancerstatsreport/ (accessed 13 March 2003).

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