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SAULO DA CUNHA MACHADO

RELAÇÃO DA FORÇA ISOMÉTRICA MÁXIMA DE QUADRÍCEPS E CINESIOFOBIA COM O DESEMPENHO NO TESTES DE CAMINHADA DE SEIS MINUTOS DE MULHERES COM OSTEOARTRITE DE JOELHO

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Tese apresentada ao Programa de Pós-Graduação em Ciências da Saúde da Universidade Federal de Sergipe como requisito parcial à obtenção do grau de Doutor em Ciências da Saúde.

Orientador: Professor Dr. Valter Joviniano de Santana Filho.
Coorientador: Professor Dr. Jader Pereira de Farias Neto

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DEDICATÓRIA

A todos aqueles que fizeram do meu sonho realidade, que me transmitiram forças para que eu pudesse superar qualquer dificuldade e alcançar todos os meus objetivos. Dedico a minha esposa, família, amigos e professores.

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RESUMO

Introdução: A osteoartrite é uma doença que promove desgaste progressivo da articulação do joelho, sendo a principal causa de dor e incapacidade locomotora no mundo. Além disso, gera alterações na capacidade de locomoção. **Objetivo**: Analisar a influência da cinesiofobia e da força muscular isométrica máxima do quadríceps no desempenho do teste de caminhada de seis minutos em mulheres com osteoartrite de joelho. **Materiais e Métodos**: Trata-se de um estudo transversal com amostra de 49 mulheres com diagnóstico de osteoartrite. A avaliação foi realizada em um único momento. Variáveis estudadas: força isométrica do quadríceps; nível de medo de movimento (cinesiofobia) e capacidade de andar. Foram realizadas análises de regressão linear simples, tendo a capacidade de marcha como variável dependente e força isométrica máxima e cinesiofobia como independentes. Os dados foram apresentados com média e desvio padrão e analisados pelo software SPSS Statistic 22.0, considerando $p<0,05$ como significativo. **Resultados**: Foi observado como principal achado a relação direta que existe entre as variáveis força isométrica máxima (FIM) de quadríceps ($p=0,01$*) e a capacidade de marcha em mulheres com osteoartrite de joelho ($R^2=0,27$); diferente da variável independente cinesiofobia que não apresentou uma estatística significativa, mostrando que ela não interfere de forma direta na capacidade de marcha. **Conclusão**: concluiu-se que há uma relação direta entre a força isométrica máxima de quadríceps e capacidade de marcha, podendo transpor o resultado para intensificar o tratamento e melhorar assim uma das maiores dificuldades desse perfil de pacientes.

Descritores: Osteoartrite do Joelho; Dinamômetro de Força Muscular; Cinesiofobia; Teste de caminhada de seis minutos.

ABSTRACT

Introduction: Osteoarthritis is a disease that promotes progressive wear of the knee joint, being the main cause of pain and locomotor disability in the world. In addition, it generates changes in the locomotion capacity. **Objective**: To analyze the influence of kinesiophobia and maximal isometric quadriceps muscle strength on the performance of the six-minute walk test in women with knee osteoarthritis. **Materials and Methods**: This is a cross-sectional study with a sample of 49 women diagnosed with osteoarthritis. The evaluation was carried out in a single moment. Variables studied: isometric strength of the quadriceps; level of fear of movement (kinesiophobia) and ability to walk. Simple linear regression analyzes were performed, with walking ability as the dependent variable and maximal isometric strength and kinesiophobia as independent variables. Data were presented with mean and standard deviation and analyzed using SPSS Statistic 22.0 software, considering $p<0.05$ as significant. **Results**: The main finding was the direct relationship between the variables maximum isometric strength (FIM) of the quadriceps ($p=0.01$*) and walking ability in women with knee osteoarthritis ($R^2=0.27$); different from the independent variable kinesiophobia, which did not show significant statistics, showing that it does not directly interfere with walking ability. **Conclusion**: it was concluded that there is a direct relationship between the maximum isometric strength of the quadriceps and walking capacity, which can transport the result to intensify the treatment and thus improve one of the greatest difficulties of this profile of patients.

Key-words: Knee Osteoarthritis; Muscle Strength Dynamometer; Kinesiophobia; Six-minute walk test.

SUMÁRIO

1. INTRODUÇÃO

A mudança do perfil epidemiológico, em virtude da maior expectativa de vida, e alteração do quadro de doenças presentes na população, que passou de um perfil contagioso para um perfil crônico, aumentou o número de pessoas com doenças crônico-degenerativas como a Osteoartrite, com impacto negativo na qualidade de vida e funcionaliadade (BALIZA, LOPES e DIAS, 2014). A funcionalidade, segundo a Organização Mundial de Saúde (OMS), é definida por diversas condições relacionadas à saúde, que envolvem fatores biológicos e psicossociais que influenciam diretamente as atividades de vida diária. Além disso, defende o modelo biopsicossocial no qual a doença não é o início de todos os problemas, mas também é um fator que influencia diretamente a qualidade de vida (WHO, 2001) (ORGANIZAÇÃO MUNDIAL DE SAÚDE, 2004).

A osteoartrite (AO) de joelho é caracterizada pela degeneração ou desgaste progressivo das estruturas anatômicas do joelho, principalmente as cartilagens e os meniscos, sendo a principal causa de dor e inabilidade locomotora no mundo. Afeta, também, a qualidade de vida dos indivíduos, particularmente os componentes sociais e físicos. Possui grande associação com a idade, fatores genéticos e ambientais, estando a articulação do joelho mais propensa ao seu aparecimento, devido à grande sobrecarga imposta à esta articulação (PENDLETON, ARDEN, *et al.*, 2000). Algumas comorbidades também são consideradas fatores de risco para o desenvolvimento da OA, tais como diabetes, obesidade, depressão, infarto do miocárdio e falha renal crônica (MCALINDON, BANNURU, *et al.*, 2014).

Epidemiologicamente, tem maior incidência na população acima dos 75 anos, com cerca de 50% destas pessoas apresentando sinais clínicos, como dor, rigidez articular matinal, crepitação óssea, perda de força e massa muscular; e radiográficos – estreitamento do espaço intra-articular, osteófitos, esclerose do osso subcondral e formações císticas (CROSS, SMITH, *et al.*, 2014).

O principal sintoma que os indivíduos com OA de joelho é a dor. Ela está diretamente associada a redução global da funcionalidade e qualidade de vida, em especial dos componentes físicos e respectivamente social. Além da dor, há uma redução global de força, flexibilidade e equilíbrio, podendo ser exacerbado devido à presença de sobrecargas articulares, diabetes, obesidade, depressão, infarto ou falha renal. Nestes, devem ser analisados a marcha, os ligamentos (especialmente cruzado anterior e posterior), estabilidade articular e avaliação dos meniscos, observando a presença ou não

de irritação – dor – dessas estruturas. Dor persistente ou presente durante a noite pode ser sinal de estágios mais avançados (PENDLETON, ARDEN, *et al.*, 2000) (MCALINDON, BANNURU, *et al.*, 2014) (ALVES e BASSITT, 2013).

Fatores mecânicos interagem de forma importante no aparecimento e progressão da OA, como a redução do volume muscular e da área de secção transversa, representando a força muscular. No entanto, as alterações nas articulações estão diretamente relacionadas à geometria e à distribuição de carga. O desalinhamento mecânico da tíbia e do fêmur faz com que a sobrecarga seja distribuída incorretamente na articulação, reduzindo a densidade da cartilagem articular e causando diminuição do espaço intra-articular. Todas essas mudanças levaram a uma redução no desempenho das atividades de vida diária e tarefas simples como caminhar, conclusões a que chegaram Frason (2013) (FRASON, BARONI e VAZ, 2013).

A capacidade de marcha é a variável cujo impacto funcional é mais observado entre os pacientes com OA, sendo o maior alvo de queixas e influenciando a mobilidade e independência desses indivíduos. Desse modo, é importante compreender tanto até onde o impacto dessa variável pode influenciar a qualidade de vida desses pacientes quanto a relação da mesma com outras variáveis (CANALE e BEATY, 2013).

Além desse sintoma, fatores pessoais e ambientais, como a cinesiofobia, podem interferir diretamente na qualidade de vida, na realização de atividades de vida diária, atividades laborais de pacientes com osteoartrite de joelho. A cinesiofobia pode ser definida como medo excessivo, irracional e debilitante de movimento e atividade física, o que resulta em sentimentos de vulnerabilidade à dor ou medo de recorrência da lesão (SMEETS, VLAEYEN, *et al.*, 2006). Assim, há a necessidade de avaliar essa interferência do medo do movimento associado a processos patológicos, para isso é necessário utilizar instrumentos de avaliação clínica para verificar o medo relacionado à dor, pois pode ajudar a diminuir os fatores citados anteriormente por Areeudomwong (2017) (AREEUDOMWONG e BUTTAGAT).

Neste sentido, o projeto justifica-se pela lacuna existente na literatura acerca das relações entre variáveis mecânicas e pessoais, já que o estudo das relações entre as variáveis mecânicas, como capacidade de marcha e força muscular, e de variáveis pessoais/ambientais como a cinesiofobia não são claros. O conhecimento dessas relações é necessário para uma melhor adaptação do processo de reabilitação desses indivíduos.

2. REVISÃO DE LITERATURA

2.1. Funcionalidade

É caracterizada como um termo macro que designa os elementos do corpo, suas funções e estruturas, as atividades humanas e a participação do ser humano nos processos sociais, indicando os aspectos positivos da interação dos indivíduos com determinada condição de saúde e o contexto em que ele vive no que diz respeito aos fatores pessoais e ambientais (BENLIDAYI, R., *et al.*, 2015).

Modelos de classificação de incapacidades foram propostos ao longo dos anos para nortear as discussões e pesquisas sobre funcionalidade. Em 1965, foi proposto o modelo linear de saúde em que se acreditava que existia uma sequência na qual as alterações funcionais ocorriam devido a uma determinada doença. Com base nesse modelo, foi proposta a ICIDH traduzida para o português no Brasil como "Classificação Internacional das Deficiências, Incapacidades e Desvantagens" (NORDENFELT, 2003).

Em 2001, a Assembleia Mundial de Saúde aprovou a atual Classificação Internacional de Funcionalidade (CIF), um modelo multidirecional em que as condições funcionais do indivíduo dependem não só da doença, mas também do meio ambiente físico e social. O uso da CIF foi recomendado na 54ª assembleia da OMS em 2001 para todos os seus países membros (WHO, 2001) (ORGANIZAÇÃO MUNDIAL DE SAÚDE, 2004).

O objetivo das Classificações Internacionais é melhorar a saúde através da produção de informações de saúde que possam ser utilizadas para apoiar tomada de decisão. A CIF faz parte das classificações desenvolvidas pela OMS e consiste num modelo biopsicossocial de classificação baseado numa abordagem biológica, individual e social que prioriza a funcionalidade como um componente de saúde e considera o ambiente como facilitador ou como barreira para a realização de ações e tarefas (NORDENFELT, 2003) (SAMPAIO e LUZ, 2009).

2.2. Osteoartrite de Joelho

Caracteriza-se por ser uma doença degenerativa não inflamatória, que afeta a cartilagem hialina, resultando em bloqueio da articulação e alteração da composição na cartilagem (MICHAEL, SCHLÜTER-BRUST e EYSEL, 2010) (CANALE e BEATY, 2013). Tal substância sofre constantemente a ação de substâncias anabólicas (fatores de crescimento – IGF I e IGF II) e catabólicas (interleucinas, fator de necrose tumoral),

mantendo-a em homeostase (YANG, RAIJMAKERS, *et al.*, 2008). Pode ser classificada em primária (causa desconhecida), ou secundária, sendo esta classificação utilizada quando a etiologia da doença é imputada a fatores traumáticos, malformações congênitas, desordens metabólicas, entre outras (MOSELEY, O'MALLEY, *et al.*, 2002).

A classificação da Osteoartrite é baseada na etiologia e severidade da doença, porém, atualmente, está restrita a avaliação através da radiografia do joelho. De acordo com Kellgreen e Lawrence (1957), os pacientes podem ser estratificados em 5 graus: grau 0, joelho normal; grau I, estreitamento do espaço articular duvidoso e possível osteófito na borda; grau II, possível estreitamento do espaço articular e osteófito definido; grau III, definido estreitamento do espaço articular, múltiplos ostéofitos moderados, alguma esclerose subcondral e possível deformidade do contorno ósseo; e grau IV, notável estreitamento do espaço articular, severa esclerose subcondral, definida deformidade do contorno ósseo e presença de grandes osteófitos (KELLGREN e LAWRENCE, 1957). De forma semelhante, a classificação de Ahlback (1968) modificada por Keyes e Goodfellow (1992), divide a OA do joelho em: grau 1 aqueles que apresentarem redução do espaço articular; grau 2 aqueles que apresentarem obliteração do espaço; grau 3 aqueles com desgaste do platô tibial <5mm; grau 4 com desgaste do platô tibial entre 5mm e 10mm; e grau 5 aqueles com grave subluxação da articulação tíbio-femural (AHLBÄCK, 1968) (KEYES, CARR, *et al.*, 1992).

Um estudo de revisão sistemática demonstrou que fatores como sintomas de dor, osteoartrite bilateral e idade avançada estão relacionadas com a piora da qualidade de vida, avaliado com o SF-36 (TÖRMÄLEHTO, MONONEN, *et al.*, 2018). Outro estudo fez a relação dos sintomas e influência da osteoartrite na capacidade funcional e qualidade de vida comparando indivíduos com e sem obesidade e foi observado que independente deste fator a osteoartrite causa a redução da qualidade de vida (GOMES-NETO, ARAUJO, *et al.*, 2016).

2.3.Tratamentos

O tratamento da osteoartrite de joelho tem como objetivo a melhoria da sintomatologia do paciente e da progressão da enfermidade, além da prevenção de maiores complicações. As três principais formas de tratamento disponíveis para essa população são o tratamento invasivo cirúrgico e tratamento não invasivo que é composto de tratamento medicamentoso e tratamento fisioterapêutico (PENDLETON, ARDEN, *et al.*, 2000).

Nos últimos anos, a American College of Rheumatology (ACR) e a European League Agaunts Rheumatism (EULAR) desenvolveram por meio de um consenso entre especialistas e evidências científicas orientações para otimizar o tratamento de OA (ZHANG, DEAN, *et al.*, 2006). Como estratégia de melhoria da qualidade de vida, os estudos têm demostrado um grande aumento da utilização de tratamentos não cirúrgicos para as osteoartrites, como consequência uma redução dos procedimentos cirúrgicos. Alguns fatores influenciaram, a exemplo do aumento dos casos de infecção pós cirúrgico e dificuldade de reabilitação (SABAH, KNIGHT, *et al.*, 2022). Outro fator, foram os gastos econômicos, ao analisar o impacto financeiro ao Sistema Único de Saúde (SUS) e ao Instituto Nacional do Seguro Social (INSS) das osteoartrites no período de 2008 a 2016, observou-se que os gastos com artroplastias no Brasil superam R$ 100 milhões por ano, sendo que o gasto médio por paciente que se submete a artroplastia de joelho chega a R$ 4.053,00 (SADIGURSKY, SAMPAIO, *et al.*, 2017).

Um estudo qualitativo verificou os principais pontos em relação ao tratamento da osteoartrite de joelho, observando pela perspectiva dos pacientes, e verificaram que eles expressaram medo e ambivalência em relação a cirurgia e a tratamentos farmacológicos a longo prazo. Estes mesmos participantes relataram ainda a necessidade do conhecimento dos profissionais de fisioterapia de técnicas que se concentrem nas necessidades dos mesmos, no alívio da dor e progressão da doença (CARMONA-TÉRES, MOIX-QUERALTO, *et al.*, 2017).

2.3.1. Tratamento Cirúrgico

A terapêutica cirúrgica é indicada em duas situações, quando o paciente apresenta grau 5 de osteoartrite, segundo Ahlbäck e/ou quando todas as possibilidades de tratamento conservador forem esgotadas, considerando os sinais radiográficos e clínicos do paciente (MICHAEL, SCHLÜTER-BRUST e EYSEL, 2010).

2.3.2. Tratamento Farmacológico

Diversas classes de medicamentos são utilizadas na terapêutica farmacológica da OA do joelho: analgésicos, anti-inflamatórios não hormonais e hormonais sistêmicos, infiltração intra-articular de corticóides, condroprotetores orais, viscosuplementação com ácido hialurônico, infiltração intra-articular com plasma rico em plaquetas (PRP) (JORDAN, ARDEN, *et al.*, 2003). O tratamento farmacológico da OA do joelho ainda é controverso, não havendo consenso sobre qual medicamento atuaria como droga modificadora da progressão da doença, sendo capaz de promover melhora clínica e funcional duradoura (DI CESARE MANNELLI, MICHELI, *et al.*, 2013).

2.3.3. Tratamento Fisioterapêutico

No ano de 2000, foram lançadas diretrizes para o tratamento clínico da OA, onde especialistas sobre a doença, baseados em estudos clínicos, propuseram orientações gerais para a escolha do tratamento clínico (farmacológico ou não), com nível de evidência A – extremamente recomendado – o uso de exercícios para o manejo dos indivíduos (PENDLETON, ARDEN, *et al.*, 2000). Além disso, estudos mais recentres vem trazendo outras estratégias fisioterapêuticas a serem acrescentadas no tratamento, como a educação, que desempenha um papel essencial na tomada de decisão, autogestão da doença e adesão ao tratamento (MALY, MARRIOTT e CHOPP-HURLEY, 2020); modalidades térmicas, como a crioterapia, tem demonstrados resultados positivos para alívio da dor desses pacientes (DANTAS, BREDA e DA SILVA SERRAO, 2019); eletroterapia através de laser e ultrassom também é bastante utilizada, principalmente no alívio da dor (STAUSHOLM, NATERSTAD e JOENSEN, 2019) (KOLASINSKI, NEOGI, *et al.*, 2020); e técnicas de terapia manual, que apresentam benefícios mais específicos para o ganho de amplitude de movimento (KOLASINSKI, NEOGI, *et al.*, 2020). Porém, não há um consenso sobre a melhor escolha de tratamento, uma vez que os tipos de intervenção não foram comparados.

Nesse consenso, intervenções não farmacológicas, não cirúrgicas, e, principalmente, a prática de exercício foram recomendadas como a primeira linha de tratamento, capaz de minimizar a dor e incapacidade de indivíduos com AO. As revisões sistemáticas mostram que os exercícios têm efeito similar aos analgésicos simples e anti-inflamatórios não esteroides, além disso, os exercícios e outros tratamentos fisioterapêuticos, realizados de forma passiva não apresentam efeitos adversos (ABBOTT, CHAPPLE, *et al.*, 2015) (FOSTER, FARLAND, *et al.*, 2015) (BENNELL e HUNTER, 2020) (KOLASINSKI, NEOGI, *et al.*, 2020).

Portanto, as diretrizes clínicas para o tratamento da osteoartrite do joelho enfatizam a educação, diversas formas de exercícios e (se apropriado) perda de peso, ao invés do uso de drogas ou cirurgia (WELLSANDT e GOLIGHTLY, 2018) (BANNURU, OSANI, *et al.*, 2019).

3. OBJETIVOS

3.1. Objetivo Geral

Investigar possíveis relações de variável mecânica e pessoal/ambiental com a capacidade de marcha de indivíduos com osteoartrite de joelho.

3.2. Objetivo Específico

Analisar a influência da cinesiofobia e força muscular isométrica do quadríceps no desempenho do teste de caminhada de seis minutos em pacientes com osteoartrite.

4. MATERIAIS E MÉTODOS

4.1. Casuística

Pesquisa do tipo transversal, onde os indivíduos que aceitaram participar voluntariamente, assinaram o Termo de Consentimento Livre e Esclarecido (TCLE) de acordo com as normas expressas na resolução n° 466, do conselho nacional de saúde. O presente estudo foi cadastrado e aprovado pelo Comitê de Ética em Pesquisa com Seres Humanos (CEP) da Universidade Federal de Sergipe (UFS) (CAAE: 64810117.0.0000.5546, aprovação nº: 1.961.364).

4.2. Participantes

A amostra foi composta por 49 mulheres, coletadas por conveniência, e quantidade validade através do cálculo amostral utilizando o G Power, pois após o início da coleta aconteceu a pandemia de COVID-19, entre aquelas acompanhadas pelo Ambulatório Clínico de Ortopedia e Traumatologia do Hospital Universitário da Universidade Federal de Sergipe (UFS), com diagnóstico clínico de osteoartrite de joelho, entre os graus 2 e 4, segundo Ahlback (AHLBÄCK, 1968) (KEYES, CARR, *et al.*, 1992), sem indicação cirúrgica, após a avaliação realizada por ortopedista. Aquelas que aceitaram participar voluntariamente assinaram o termo de consentimento livre e esclarecido de acordo com as normas expressas na resolução 466 do Conselho Nacional de Saúde.

Foram utilizados como critérios gerais de inclusão: mulheres com idade entre 30 e 80 anos; que apresentaram dor acima de 3, numa escala de 0 a 10; funções cognitivas preservadas e disponibilidade para realização do programa.

Foram excluídas ou descontinuadas da pesquisa aquelas que: não concordarem com o termo de consentimento; apresentaram procedimentos cirúrgicos prévios no joelho ou tiveram indicação atual; outras comorbidades ou patologias degenerativas ou autoimunes; não conseguiram realizar as avaliações ou o protocolo de reabilitação; e que apresentaram dor em algum outro segmento que seja superior a dor no joelho.

4.3. Design do Estudo

4.3.1. Avaliação

Inicialmente as participantes foram avaliadas pelo ortopedista sobre o grau de severidade de osteoartrite do joelho e elegibilidade dele na pesquisa. Posteriormente, as participantes preencheram a ficha de avaliação, contendo dados epidemiológicos e sociodemográfico e aceitaram a participação, concordando com o TCLE. Posteriormente foi realizado, por pesquisadores/alunos de iniciação científica previamente capacitados, o protocolo de avaliação.

4.3.2. Variáveis e Procedimentos

- Desempenho do Teste de Caminhada de 6 minutos: num corredor demarcado a cada 1 metro, totalizando 30 metros de extensão, percorreu o trajeto caminhando, sendo instruída a manter a máxima velocidade, o mais constante possível durante 6 minutos, realizando a maior quantidade de voltas no corredor até o final do tempo. Foi orientada a verbalizar desconfortos, bem como a possibilidade de interromper o teste a qualquer instante, caso necessário. Ao final do teste, foi registrado a quantidade de metros percorridos. O protocolo desse teste seguiu todos os preceitos propostos (ATS, 2002) (RESQUETI, OLIVEIRA, *et al.*, 2009).

- Cinesiofobia: avaliado por meio da Escala Tampa para Cinesiofobia (ETC): com esse instrumento foi investigado o nível de medo ao movimento dos pacientes. É composto por 17 itens que abordam dor e intensidade dos sintomas, os escores variam de 1 a 4, o máximo obtido são 68 pontos e o mínimo 17 pontos. De acordo com o escore da escala 1 ponto “discordo totalmente”, 2 pontos “discordo parcialmente”, 3 pontos “concordo parcialmente”, 4 pontos “concordo totalmente”. Quanto maior a pontuação, maior o grau de cinesiofobia do paciente (SIQUEIRA, TEIXEIRA-SALMELA e MAGALHÃES, 2007) (VLAEYEN, KOLE-SNIJDERS, *et al.*, 1995).

- Força Muscular Isométrica de Quadríceps: foi realizado por meio de uma célula de carga, ligada ao dispositivo de análise de sinal, versão 1.8.1 da ChronoJump Boscosystem (Force Sensor Kit, Espanha) colocado em uma cadeira extensora comumente utilizada para exercícios de fortalecimento, onde o indivíduo fica sentado, com os joelhos a 90° e o quadril a 110°, garantido assim o maior o torque do músculo avaliado (quadríceps), onde foi solicitado que realizasse o máximo de força possível para o movimento de extensão de joelho, sustentando por 10 segundos (DE VASCONCELOS, BEVILAQUA-GROSSI, *et al.*, 2009).

4.3.3. Análise Estatística

Os dados foram apresentados através de média e desvio padrão. Para a variável Dinamometria, foi feita a soma dos valores encontrados no membro inferior direito e esquerdo. Para análise da normalidade foi utilizado o teste de Shapiro Wilk. Foi realizado também um teste de Correlação Parcial, considerando a Idade como covariável. Foi feita análise de regressão linear simples tendo como variável dependente o valor da Capacidade de Marcha e como independentes Cinesiofobia e Dinamometria. As análises estatísticas foram realizadas no software SPSS Statistic 22.0, com valores de p considerados significantes quando menores do que 0,05.

5. RESULTADOS

Participaram 49 mulheres com diagnóstico de osteoartrite de joelho. Os dados de caracterização estão apresentados na tabela 2, na qual também está demonstrado o valor de significância obtido através do teste de normalidade, indicando assim ser uma população homogênea, já que não houve diferença nas variáveis de caracterização.

Tabela 2 – Caracterização da amostra.

Variáveis	Média (DP)	p
IDADE (anos)	58,49 (9,43)	0,23
PESO (Kg)	78,93 (13,26)	0,76
ALTURA (m)	1,55 (0,07)	0,24
IMC (Kg/m²)	32,6 (6,33)	0,48

Legenda: Os dados estão apresentados em média e desvio padrão e os valores de p estão representando os valores do teste de normalidade: Shapiro-Wilk. DP= Desvio Padrão (n=49)

Os valores encontrados na avaliação da Cinesiofobia e Força Isométrica Máxima de Quadríceps através do Dinamômetro, estão apresentados na tabela 3 e são demonstrados por média e desvio padrão.

Tabela 3 - Resultado da avaliação da capacidade de marcha, cinesiofobia e força isométrica máxima

	Média (DP)
Capacidade de Marcha	338,12 m (98,64)
Cinesiofobia	48,46 (5,67)
Força Isométrica Máxima	37,32 N (18,26)

Legenda: DP= Desvio Padrão; m= metros; N= Newtons

Os valores encontrados na análise de regressão linear simples estão apresentados na tabela 4. Para essa análise foi tomado como variável dependente a capacidade de marcha, avaliada através do teste de caminhada de seis minutos, e como variáveis independentes a cinesiofobia e força isométrica máxima de quadríceps.

Tabela 4 - Resultado da análise de regressão linear simples da avaliação da cinesiofobia com FIM.

Variável Dependente	Variável Independente	R^2	B_0	B_1	P
Capacidade de Marcha	Cinesiofobia	0,16	443,74	-2,18	0,39
	FIM	0,27	266,42	1,92	0,01*****

Legenda: FIM= Força Isométrica Máxima. Foi realizado uma correlação parcial com a Idade como covariável. B_0 = Beta da constante, B_1= Beta da variável independente. Significância $p<0,05$. * = Significância.

Como pode ser observado, a variável independente cinesiofobia não apresentou uma estatística significativa, mostrando que ela não interfere de forma direta na capacidade de marcha; diferente da força isométrica máxima que apresentou diferença significativa, demonstrando que há uma interferência direta na capacidade de marcha.

O R^2 deve ser interpretado em porcentagem mostrando que das diversas variáveis que podem interferir na capacidade de macha, a força isométrica máxima representa 27% e como o valor de Beta da variável independente foi dado positivamente, a relação é direta, ou seja, quanto maior a força isométrica maior a capacidade de marcha.

6. DISCUSSÃO

O presente estudo teve como objetivo principal investigar possível relação da capacidade de marcha com uma variável mecânica e um fator pessoal/ambiental de indivíduos com osteoartrite de joelho através de uma revisão sistemática. Conforme demonstrado anteriormente, as participantes da pesquisa tinham características homogêneas. Através dos protocolos aplicados, foi observado como principal achado a relação direta que existe entre as variáveis força isométrica máxima (FIM) de quadríceps ($p=0,01^*$) e a capacidade de marcha em mulheres com osteoartrite de joelho ($R^2=0,27$). Isso pode ser constatado através dos valores de significância encontrados quando realizada uma regressão linear entre o escore da força isométrica máxima e capacidade de marcha.

Um estudo cita que a diminuição da força de quadríceps encontra-se em torno de 30 a 50% em indivíduos portadores de OA, quando comparado a indivíduos saudáveis dentro da mesma faixa etária (FISHER, PENDERGAST, *et al.*, 1991). Nesse estudo, os autores sugerem também que o desequilíbrio de força muscular entre flexores e extensores, sendo que, geralmente, a diminuição de força de quadríceps ocorre de forma mais acentuada que a dos isquiotibiais. Este desequilíbrio pode causar alterações funcionais que aceleram a degeneração articular e/ou causam incapacidade funcional. Além da relação do quadríceps, observa-se que a inclinação lateral reduz a demanda nos músculos abdutores do quadril, potencialmente levando ao enfraquecimento do abdutor ao longo do tempo. O glúteo médio é o principal abdutor do quadril e uma grande porção deste músculo atua no plano frontal, para estabilizar a pelve e parte inferior da perna durante a marcha. Um aumento na inclinação lateral do tronco é frequentemente empregado pelos participantes para aliviar o joelho medial (BENNELL e HINMAN, 2011).

No sentindo da investigação da influência da doença na incapacidade de marcha, o Teste de Caminhada de Seis Minutos se destaca, pois além de avaliar a capacidade aeróbica pode ser interpretado também como uma avaliação de capacidade de marcha para indivíduos que apresentam alterações osteomusculares de membros inferiores. Esse teste pode ser relacionado com alterações da função física, uma vez que, quanto maior a distância percorrida, melhor sua capacidade (DUARTE, DOS SANTOS, *et al.*, 2013).

O referencial teórico supracitado corrobora com os achados do presente estudo, pois as mulheres que apresentaram maior força muscular isométrica de quadríceps obtiveram um escore melhor no Teste de Caminhada de Seis Minutos, apontado assim, melhor capacidade de marcha, comprovando que a relação direta entre as variáveis é clinicamente efetiva e sendo levado assim como estratégia para tratamento desses pacientes.

Estudos que realizaram fortalecimento isométrico do músculo quadríceps demonstraram que houve melhoria da qualidade de vida por meio da redução da dor e melhoria na funcionalidade (MINSHULL e GLEESON, 2017). Além disso, houve melhoria na estabilidade na posição em pé e atividade de levantar-se da cadeira, fatores esses que necessitam de força dos membros inferiores. Portanto, é possível confirmar que quanto menor a força isométrica dos músculos quadríceps em pacientes com osteoartrite de joelho, menor também a qualidade de vida e funcionalidade (COUDEYRE, JEGU, *et al.*, 2016).

Além das limitações estruturais e funcionais causadas pela osteoartrite de joelho, dor e incapacidade também afetam a conexão social, relacionamentos e bem-estar emocional; subsequentemente, reduzindo a qualidade de vida (CORTI e RIGON, 2003). Uma das afecções pessoais/ambientais é a cinesiofobia, considerada uma estratégia mal adaptativa que leva a evitar a atividade física por causa de temor relacionado à dor (KORI, 1990). A experiência da dor pode criar um ciclo vicioso em que há desordens cognitiva e comportamental de uma forma amplificada. Porém, a parte inicial deste estudo demonstrou que, quando relacionada a capacidade de marcha não há uma relação direta entre elas.

Outros estudos com essa mesma população relataram que a distância percorrida em metros durante o teste de caminhada de seis minutos foi significativamente maior para os pacientes sem cinesiofobia do que o adverso (DOURY-PANCHOUT, METIVIER e FOUQUET, 2015), o que difere dos achados estatísticos encontrados na população do presente estudo, onde manifestou-se um valor negativo de B^1 (B^1=-2,18) explanando que a relação não é direta, então, recomenda-se a realização de mais estudos com bom rigor metodológico associando essas variáveis para assim examinar de forma mais adequada essa relação. Essa divergência com outras pesquisas pode se dá devido aos participantes do presente estudo apresentar um grau de cinesiofobia moderado, podendo, em uma população com maiores graus de cinesiofobia essa relação apresentar-se de forma direta.

Por ser uma doença funcionalmente limitante, muitas vezes prejudica a capacidade do indivíduo em realizar as atividades de vida diária, portanto, representando um fator de risco relevante para hipocinesia e comportamento sedentário. Essas mudanças no estilo de vida dos pacientes com OA podem levar a um processo de sarcopenia, no qual há uma redução acentuada de massa muscular e força, que desempenham um papel fundamental na proteção das articulações (ONODERA, COELHO-JÚNIOR, *et al.,* 2020).

Por fim, a regressão simples aponta que a variável independente cinesiofobia não apresentou uma estatística significativa, mostrando que ela não interfere de forma direta na capacidade de marcha; diferente da força isométrica máxima apresentou diferença significativa, interferindo diretamente na capacidade de marcha.

7. CONCLUSÕES

Concluímos que há uma relação direta entre a força isométrica máxima de quadríceps e capacidade de marcha, além disso foi observado que não houve comprovação da existência dela com a variável independente cinesiofobia, não apresentando uma estatística significativa, mostrando que ela não interferiu diretamente na capacidade de marcha da nossa amostra. Levando-se em consideração os resultados encontrados no estudo transversal, a partir das análises de regressão linear simples, utilizando como variável dependente a capacidade de marcha pelo teste de caminha de seis minutos e independente a cinesiofobia e força isométrica de quadríceps.

8. APLICAÇÕES PRÁTICAS E LIMITAÇÕES

Com os achados dessa pesquisa podemos sugerir um acréscimo ou intensificação de exercícios que tenham como base o objetivo de melhorar a força isométrica de quadríceps de mulheres com osteoartrite de joelho, a fim de, segundo a relação direta, melhorar também a capacidade de marcha. Além disso, demonstrou-se uma necessidade de incluir avaliações de fatores ambientais e pessoas, como a cinesiofobia, já que, mesmo não tendo mostrado uma relação direta, a capacidade de marcha se mostrou inversamente proporcional ao medo do movimento.

A pesquisa passou por algumas dificuldades provocando assim algumas limitações. O projeto inicialmente seria um ensaio clínico, que foi iniciada as coletas no ano de 2020, mesmo ano que iniciou a pandemia da COVID-19, impedindo assim a continuidade da pesquisa como planejado inicialmente. Com isso, este projeto foi modificado e novos planejamentos foram traçados. Planejamentos esses que, além deste trabalho, darão outros frutos em forma de artigos. A exemplo da revisão sistemática que está em processo de análise estatística para dá segmento à submissão.

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10. ANEXO 01 – FICHA DE AVALIAÇÃO

FICHA DE AVALIAÇÃO

Data:____/____/____ Avaliação: Inicial ( ) 6 Semanas ( ) 12 Semanas ( ) 24 Semanas ( )

Nome: _____

RG:_____ Idade:_____ Gênero:_____

Tel.:_____

Peso:_____Altura:_____ IMC:_____ Nº do Prontuário:_____

Endereço:_____

Profissão:_____

Doenças associadas: _____

Cirurgias prévias:_____

Antecedentes pessoais:

( ) Tabagismo: ____cigarros/dia ( )ex há_____( ) Etilista ( )ex há_____

( )Dislipidemia ( )HAS( )Diabetes ( )AVC ( ) DPOC ( )ICC grau___

Sedentário: Sim ( ) Não( ) Se não: Qual atividade pratica?_____

Quantas vezes por semana pratica atividade: _____

Sinais Vitais:SpO_2:_____ PA:_____FR:_____ FC:_____

Medicamentos em uso:_____

Teste de Caminhada de 6 minutos:

Tempo	SatO2	FC	FR	Borg Dispnéia	Borg MMII	PA
0’						
3’				----------	----------	----------
6’						

Distância Percorrida:_____ Percentual Previsto: _____

Obs: _____

Escala Tampa para Cinesiofobia:

Para cada afirmativa, por favor, indique um número de 1 a 4, caso você concorde ou discorde da afirmativa. Primeiro você vai pensar se concorda ou discorda e depois, se totalmente ou parcialmente.

	Discordo totalmente	Discordo parcialmente	Concordo parcialmente	Concordo totalmente
1. Eu tenho medo que eu possa me machucar se eu fizer exercícios.	1	2	3	4
2. Se eu tentasse superar esse medo, minha dor aumentaria.	1	2	3	4
3. Meu corpo está me dizendo que algo muito errado esta acontecendo comigo.	1	2	3	4
4. Minha dor provavelmente seria aliviada se eu fizesse exercício.	1	2	3	4
5. As pessoas não estão levando minha condição médica a serio.	1	2	3	4
6. Minha lesão colocou o meu corpo em risco para o resto da minha vida.	1	2	3	4
7. A dor sempre significa que eu machuquei meu corpo.	1	2	3	4
8. Só porque alguma coisa piora minha dor, não significa que é perigoso.	1	2	3	4
9. Eu tenho medo que eu possa me machucar acidentalmente.	1	2	3	4
10. Simplesmente sendo cuidadoso para não fazer nenhum movimento desnecessário e a atitude mais segura que eu posso tomar para prevenir a piora da minha dor.	1	2	3	4
11. Eu não teria tanta dor se algo potencialmente perigoso não estivesse acontecendo no meu corpo.	1	2	3	4
12. Embora minha condição seja dolorosa, eu estaria melhor se estivesse ativo fisicamente.	1	2	3	4
13. A dor me avisa quando parar o exercício para que eu não me machuque.	1	2	3	4
14. Não é realmente seguro para uma pessoa com minha condição ser ativo fisicamente.	1	2	3	4
15. Eu não posso fazer todas as coisas que as pessoas normais fazem, porque para mim e muito fácil me machucar.	1	2	3	4
16. Embora algo esteja me causando muita dor, eu não acho que seja, de fato, perigoso.	1	2	3	4
17. Ninguém deveria fazer exercícios, quando está com dor.	1	2	3	4

11. ARTIGOS

ARTIGO 1 – Artigo Publicado (Indexado PubMed)

Revista "**Pain Research and Management"** – Qualis A3 (IF: 3,03 / CiteSore: 4.0)

Hindawi
Pain Research and Management
Volume 2022, Article ID 1466478, 6 pages
https://doi.org/10.1155/2022/1466478

Research Article

Knee Osteoarthritis: Kinesiophobia and Isometric Strength of Quadriceps in Women

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Academic Editor: Ji Tu

ARTIGO 2 – Artigo Publicado

Revista **"Motricidade"** – Qualis B2 (CiteScore: 0,7)

ORIGINAL ARTICLE

https://doi.org/10.6063/motricidade.27173

Reproducibility of the dynamic balance test of lower limbs with reduction of the body weight in individuals with knee osteoarthritis

Saulo da Cunha Machado[1]*, Valter Joviniano de Santana Filho[1], Érika Thatyana Nascimento Santana[1], Viviane Nascimento Brandão Lima[1], Wélia Yasmin Horacio dos Santos[1], Walderi Monteiro da Silva Júnior[1], Jader Pereira de Farias Neto[1], Pedro José Marin[2], Marzo Edir da Silva-Grigoletto[3]

ABSTRACT

The dynamic balance of the lower limbs has shown great importance in accomplishing activities of daily living, especially for walking and maintenance in the orthostatic position. In this context, individuals with knee osteoarthritis have changes in their physical capacity, mainly due to joint changes and muscular wear. The instrument called OctoBalance® is one of the most used to evaluate this balance, which analyses four different executions of movement in the limbs. However, individuals with knee osteoarthritis cannot perform this evaluation due to the need for single limb support during movements. This study aimed to verify whether it is reproducible to perform the dynamic balance evaluation of lower limbs with a reduction of 10% of body weight through a suspension system. A cross-sectional study was carried out with 2 collections with a 48-hour interval between them, using the Lower Body Test performed with OctoBalance®. The dynamic balance test followed the protocol of 3 repetitions observing the learning factor and then 3 repetitions where the values were collected, with the suggested adaptation for all 4 diagonals in both limbs. The interclass correlation index (ICI), coefficient of variation (CV), estimative standard error (EEE) and minimum detectable difference (MDD) were calculated as indicators of reproducibility. Also, Bland-Altman Graphs were used for visual verification of the agreement between the means. Results: The reliability tests showed a very high interclass correlation through the ICI and low variation values for all the movements evaluated through the CV. The EEE and MDD calculations showed positive responses for greater reliability, and the Bland-Altman graphs showed an agreement between the means. Reproducibility was positive for the Lower Body Test with the Octobalance® platform for the evaluation of lower limb dynamic balance in women with knee osteoarthritis.

KEYWORDS: knee osteoarthritis; balance test; reproducibility.

ARTIGO 3 – Artigo a ser submetido

Uma revisão sistemática, com o título: **"Abordagens fisioterapêuticas no manejo da dor e funcionalidade em pacientes com osteoartrite de joelho: uma revisão sistemática."** está em processo final de tradução para ser submetida.

Inicialmente, a pretensão de publicação é na revista **"Osteoarthritis and Cartilage" –** Qualis A1 (CiteScore: 10,2).

Normas para submissão

Submission of Manuscripts

Effective with manuscripts submitted for publication on or after November 1, 2017, Osteoarthritis and Cartilage is instituting an accepted article fee. The corresponding author of an accepted manuscript will be emailed a link once the article has been accepted enabling them to make the payment of $US400 prior to receiving the page proof. [Note: the accepted article fee applies only to ACCEPTED manuscripts] A DOI number will be assigned when the funds have been received and the article has moved into production. Individual waiver requests will be considered on a case-by-case basis and may be granted in cases of genuine need. Priority for this waiver program will be given to applications by authors from countries eligible for the Research4Life program. Open access article charges are still in effect but are inclusive of the accepted article fee. That is, authors opting for open access will not be asked to pay the accepted article fee. Please contact Ms. Tanya Wheatley (T.Wheatley@elsevier.com) if you have any questions.

Manuscripts are to be submitted through the Editorial Manager on-line submission and peer-review system. Access to Osteoarthritis and Cartilage submission system is as follows:

https://www.editorialmanager.com/OAC/default.aspx

In order to access Editorial Manager, mouse click on Register in the upper left corner. Once you have established your Username and Password, you can sign on as an author and enter the information for submitting a new manuscript.

Prepare your manuscript for upload as follows: • Create a file containing just the title page and abstract

• Create a file containing the main text of the manuscript, including all references, excluding the title page and abstract

• Do not include figures within the main text file, but supply these as separate image files

For any additional information, please contact the Editor:

Joel Block, at

Osteoarthritis and Cartilage, Division of Rheumatology, Rush Medical College, Rush University Medical Center, 1611 West Harrison Street, Suite 510,

Chicago,IL 60612,

USA

Email: OAC@elsevier.com

Submissions become the property of the Osteoarthritis Research Society International.

Please note that Osteoarthritis and Cartilage authors are now able to enhance their submissions by employing the new Content Innovation Tools described in more detail in Section 1.7.13 of this Guide for Authors ? please follow the instructions outlined in that section to use the new Tools.

Please read and follow the instructions to authors outlined below. Failure to follow these instructions will delay processing of the manuscript.

1. MANUSCRIPT FORMAT

The maximum word count listed for each type of article excludes title page, abstract, tables, figure legends, acknowledgements and contributions, and references.

Manuscript format should comply with the International Committee of Medical Journal Editors' 'Uniform Requirements for Manuscripts Submitted to Biomedical Journals' (http://www.icmje.org).

In all matters of style, please consult the Manual of Style (ed. 8) published by the American Medical Association. Number each page sequentially and add line numbers, including the title page, abstract, text, references, figure legends, and tables. Authors are responsible for providing a manuscript written in clear English. Delay or rejection may result when papers are poorly written and in need of extensive editing. Where appropriate, authors should obtain the help of an individual or organization competent in Medical Scientific English, where English is the primary language.

Additional points: insert an extra blank line at the end of headings and paragraphs; type text without end of line hyphenation, except for compound words; be consistent with punctuation and only insert a single space between words and after punctuation.

Avoid abbreviations whenever possible, and never use unfamiliar abbreviations. When use of an abbreviation is customary, list the full word on its first appearance followed by the abbreviation in parentheses. Once identified, the abbreviation should be used consistently throughout the text.

Measurements should be expressed in metric units wherever possible, and along with physical and chemical quantities, should be abbreviated as recommended in the instructions to authors of the current volume of Journal of Biological Chemistry. Symbols of units of measurement must accord with the Système International (SI). Abbreviations for SI units and statistical terms are those in Baron DN (ed.) Units, Symbols and Abbreviations: A Guide for Medical and Scientific Editors and Authors, 5th ed. London: Royal Society of Medicine Press. Preferred alternative units may be given in parentheses.

Generic names should be used for drugs. When proprietary brands are used in research, include the brand name and the name of the manufacturer in parentheses at the first mention of the generic drug name in the methods section.

Guidelines for the reporting of many different types of studies are available through the EQUATOR network (Enhancing the Quality and Transparency of Health Research; http://www.equator-network.org/).

1.1. Ten Recommendations for OAC Manuscript Preparation

Ten recommendations for Osteoarthritis and Cartilage manuscript preparation, with special attention to enhancing Statistical validity.

These recommendations are intended to provide a framework for a clear, complete, and unambiguous presentation of data, methods, and results. It is of paramount importance, and one of the tenets of good research that published studies and experiments can be reproduced, and that the description of their outcome includes sufficient

information to allow a reasonable assessment of unavoidable limitations and weaknesses. In one word: transparency.

These recommendations describe what information should be presented to the reader, and how, in order to facilitate the interpretation of the findings; it is not to specify how authors should evaluate and interpret their data. Additional guidelines and details for specific types of research are available elsewhere in this Guide for Authors.

1. State the research question and the purpose of the study. Is the ambition to describe an observation, to generate hypotheses or to estimate parameters of interest?

2. Describe the source of study participants, patients, cadavers, animals, tissues, cell lines, etc., and how many of these units that have been included in the study. What inclusion criteria did you use? How representative is your sample? To what population do you wish to generalize the findings of your study? Note that direct generalization to other cases than those studied requires information on the variability between independent cases. If all observations have been sampled from one subject, animal or cell line, direct generalization cannot be made beyond this.

3. When observations can be presented individually, either numerically (ex. table with raw data) or graphically (ex. points in figures), this should be preferred. In some cases such presentation could in itself be sufficient, in other cases it may complement the summary measures in the manuscript or in a web supplement. When fewer than 20 observations are presented, graphical representations should display individual data points (e.g. dot plot).

4. When presenting descriptive data in aggregated form, always provide the number of included observations (n) as well as adequate measures of central tendency (mean, median, etc.) and dispersion (standard deviation, range, etc.). If repeated measurements or replicates are used, present both the number of independent samples and the number of repeated observations per independent sample.

5. Describe all statistical methods in the Methods section, using well recognized terms such as Student's or Satterthwaite's t-test rather than names that are unique to a particular statistical software package such as "independent groups t-test". You should always identify the statistical software and version used.

6. The validity of the results from statistical models relies on certain assumptions being fulfilled. For example, Student's t-test is based on the assumptions of independent observations, Gaussian distribution and homogeneous variance. Describe in the statistical methods section whether you have examined if these assumptions are fulfilled, how you performed this investigation, and what the results were. When violations of the assumptions are detected, a change to an alternative method or data transformation may be necessary to ensure validity.

7. Generalizations from observed data are often made using statistical models. We recommend that results from statistical analysis are presented with a confidence interval for the quantity of interest. The quantity of interest is typically a difference between means of two groups, risk ratio, hazard ratio, slope of linear regression etc. It is not sufficient to report confidence intervals for within-group parameters, if the conclusions are made about between-group differences. Confidence intervals provide more information on the inferential uncertainty than is included in a p-value because they describe a range of plausible and interpretable values. It is important to recognize that this range of plausible values represents the uncertainty in a generalization, not the dispersion of observed data. While standard deviations and ranges can be used to describe dispersion, confidence intervals and standard error of the means represent uncertainty. When this

uncertainty is presented in text and tables, or graphically with error bars, Osteoarthritis and Cartilage recommends using 95% confidence intervals instead of S.E.M.

8. Statistical analysis can also lead to calculation of p-values. P-values describe the inferential uncertainty in terms of risk of a false positive conclusion. It should be recognized that: (1) tested hypotheses always relate to the generalization of an observation, never to the observation itself, (2) that merely because a finding is "statistically significant" does not necessarily imply that it has practical or clinical importance, and (3) that failure to achieve statistical significance in a test does not necessarily indicate similarity. Thus, if any p-values are reported they should be accompanied with an interval estimate of the quantity of interest (ex. confidence interval for mean difference between the groups).

Do not use "statistical significance" (or "significance") to classify or describe your results, as such a label provides no additional information above what is included in the confidence interval (or a p-value if reported). Instead, interpret the values included in the confidence intervals reported and interpret their biological or clinical relevance in light of potential biases present in the study. For further guidance, please see: https://www.tandfonline.com/doi/full/10.1080/00031305.2019.1583913.

9. Please avoid common misconceptions:

a)Statistical nonsignificance($p>0.05$, ns, or NS)is NOT evidence of equivalence, non-inferiority, or "no difference".

b) Statistical significance is NOT evidence of clinical or practical relevance. This must be shown by other means than p-values, and the actual relevance of the findings must be clearly articulated.

c) Correcting p-values for the multiple testing of X groups does NOT generally solve the multiplicity problems inherent in testing many endpoints. When using Bonferroni (or another) correction, a strategy for addressing multiplicity issues should be presented and its consequences for the conclusions should be explained.

d) Repeated or multiple measurements per individual are NOT statistically independent (not even if their intraclass correlation coefficient is 0). The statistical analysis needs to properly account for the correlation between the observations.

10. The level of statistical rigor (and remaining inferential uncertainty in the results) should be in parity with the purpose of the study and the author's conclusions. For example, a confirmatory randomized clinical trial has little room for multiplicity issues arising from the testing of multiple endpoints. If such issues exist, they should be properly addressed already in the design of the trial. Hypothesis generating studies, on the other hand, can be analyzed without concerns for multiplicity, and case-reports (studies with very small n) may be entirely descriptive with no need for evaluation of inferential uncertainty.

A brief description of the analysis strategy in the statistical methods section will facilitate the reading of the manuscript. Authors are strongly recommended to save statistical code, output from data analyses, and raw data and raw images for possible review, should the editors request this.

Adherence to these recommendations will greatly facilitate the review of manuscripts, decrease the likelihood of multiple revisions, and improve the chances of acceptance for publication.

Recommended reading:

1. Ronald L. Wasserstein and Allen L. Schirm and Nicole A. Lazar, Moving to a World Beyond "$p<0.05$". The American Statistician 2019; 73(sup1):1-19

2. Cumming G, Fidler F, Vaux DL. Error bars in experimental biology. J Cell Biol 2007;177:7-11.

3. Vaux D. Ten rules for the presentation and interpretation of data in scientific publications. Australian Biochemist 2008;39:37-9.

4. Ranstam J. Sampling uncertainty in medical research. Osteoarthritis Cartilage 2009;17:1416-9.

5. Ranstam J. Reporting laboratory experiments. Osteoarthritis Cartilage 2010;18:3-4.

6. Ranstam J, Lohmander LS. What's in a number or in a picture? Osteoarthritis Cartilage 2010;18:1003-5.

7. Ranstam J, Lohmander LS. Ten recommendations for OAC manuscript preparation, common for all types of studies. Osteoarthritis Cartilage 2011;19:1079-80.

8. Turkiewicz A, Luta G, Hughes HV, Ranstan J. Statistical mistakes and how to avoid them - lessons learned from the reproducibility crisis.

1.1.1 Manuscripts reporting Clinical Trials

All randomized controlled trials submitted for publication in the journal should follow the Consolidated Standards of Reporting Trials (CONSORT) guidelines, and include a completed CONSORT flow chart as a manuscript figure. Please refer to the CONSORT statement website at http://www.consort-statement.org for more information. A copy of the study protocol and statistical analysis plan, if one has been developed, should be included with the submitted manuscript, together with a completed CONSORT checklist. This checklist can be found for downloading on the CONSORT website.

Osteoarthritis and Cartilage has adopted the proposal from the International Committee of Medical Journal Editors (ICMJE) which requires, as a condition of consideration for publication of clinical trials, registration in a public trials registry such as http://www.clinicaltrials.gov/ or http://www.isrctn.com/. All trials that began enrolling patients after July 1, 2005, must have been registered at or before onset of patient enrollment. Any trial which was still seeing patients on September 13, 2005, should have been registered before September 13, 2005. If the trial was complete before September 13, 2005, the trial should be registered before manuscript submission. The clinical trial registration number should be included at the end of the abstract of the article. Clinical trial manuscripts that do not fulfill these criteria will not enter the editorial process, but will be returned to the authors.

For this purpose, a clinical trial is defined as any research project that prospectively assigns human participants or groups of humans to one or more health-related interventions to evaluate the effects of health outcomes. Health-related interventions include any intervention used to modify a biomedical or health-related outcome (for example drugs, surgical procedures, devices, behavioral treatments, dietary interventions, and process-of-care changes). Health outcomes include any biomedical or health-related measures obtained in patients or participants, including pharmacokinetic measures and adverse events. Purely observational studies (those in which the assignment of the medical intervention is not at the discretion of the investigator) do not currently require registration. Further information can be found at http://www.icmje.org. Disclosure of Clinical Trial Results. 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 (500 words) abstract or table. However, divulging results in other circumstances (e.g., investors' meetings) is

discouraged and may jeopardize consideration of the manuscript. Authors should fully disclose all posting in registries of results of the same or closely related work.

1.1.2 Reporting observational studies in epidemiology

Manuscripts submitted for publication in the journal reporting observational studies in epidemiology should conform with the recommendations of the STROBE initiative (STrengthening the Reporting of OBservational studies in Epidemiology). Checklists for different types of observational studies are available at https://www.strobe-statement.org/index.php?id=available-checklists. Manuscripts reporting observational studies based on electronic register data should comply with RECORD guidelines (https://www.record-statement.org/). A completed checklist should be submitted with the manuscript. Adherence to these recommendations will greatly facilitate the review of manuscripts, decrease the likelihood of multiple revisions, and improve the chances of acceptance for publication.

1.1.3 Reporting animal and laboratory experiments

To fully understand the context, methods, data and conclusions that relate to an experiment, the reader must have access to appropriate background information. The experiment should be described in a way that makes it possible for the reader to repeat it. A clear description of the chosen study design is necessary for the reader's understanding of both the experiment and the statistical analysis of the data generated by the experiment.

Analysis units. Describe the experimental unit clearly. This is usually the smallest unit that can be independently randomized to a group, i.e. it should be possible to randomize any two experimental units to different groups. The experimental unit should also be the statistical analysis unit. Additional information relevant to the analysis units in basic science can be found in https://elifesciences.org/articles/32486.

Experimental design. Describe the randomization procedure (or another procedure used to allocate experimental units to groups), and present the number of randomized units, independent units and the total number of units in the study. Describe clearly which units are dependent and which are independent and how potential dependence was handled in the statistical analysis. Describe if the conduct of experiment and outcome assessment were done blinded or not. Formal experimental designs, like randomized block, latin square, split-plot, etc., have been developed and are described in a number of statistical textbooks. State clearly if one of these formal designs are used. If this is not the case, describe and explain the used design in detail. A useful list of important issues in design and analysis or laboratory studies can be found in RIPOSTE (https://elifesciences.org/articles/05519).

Additional information relevant to the high quality reporting of animal model studies in osteoarthritis research may be found in the following OAC publications: Reference 1), Reference 2 and Reference 3

Osteoarthritis and Cartilage supports the ARRIVE (Animal Research: Reporting In Vivo Experiments) guidelines to improve standards of reporting of animal experiments and ensure that the data can be fully evaluated and utilized [https://journals.plos.org/plosbiology/article?id=10.1371/journal.pbio.1000412]
(Kilkenny C, Browne WJ, Cuthill IC, Emerson M, Altman DG (2010) Improving Bioscience Research Reporting: The ARRIVE Guidelines for Reporting Animal Research. PLoS Biol 8(6): e1000412. doi:10.1371/journal.pbio.1000412). A completed ARRIVE checklist should be submitted with the manuscript. Adherence to these

recommendations will greatly facilitate the review of manuscripts, decrease the likelihood of multiple revisions, and improve the chances of acceptance for publication.

The design and analysis of experiments using microarray technology poses some specific challenges, and authors intending to submit such studies to Osteoarthritis and Cartilage are recommended to read the article "Churchill GA. Fundamentals of experimental design for cDNA microarrays. Nature Genetics suppl. 2002;32:490-5. Doi10.1038/ng1031". Many journals, including Osteoarthritis and Cartilage, now also require, as an example, that authors reporting microarray-based experiments comply with the Minimum Information about a Microarray Experiment (MIAME) checklist as a prerequisite for publication. Similar minimum information guidelines are available for reporting proteomics (MIAPE http://www.psidev.info/miape/) and other types of 'omics' studies. For further reading on evolving reporting guidelines, see Minimum reporting guidelines for biological and biomedical investigations (MIBBI) (http://mibbi.sourceforge.net/projects/MIAME.shtml).

1.1.4 Reporting studies that utilize machine learning or artificial intelligence

For submissions employing machine learning (ML) or artificial intelligence (AI) methods, we recognize that the community has not reached consensus on appropriate reporting requirements. We emphasize, however, that as a biomedical journal it is our mission is to publish research that furthers the understanding of the biology and clinical care of osteoarthritis. As such, it is imperative that any prediction model be sufficiently open and accessible to permit external validation, and we encourage authors to provide applicable data sets or executable code for review.

For authors' convenience, we endorse the CLAIM checklist, https://pubs.rsna.org/doi/full/10.1148/ryai.2020200029. However, until such a consensus has been reached, we will accept adherence to any of the published guidelines proposed by mainstream organizations, such as the RSNA (Bluemke DA et al., https://doi.org/10.1148/radiol.2019192515), theNeurIPS Reproducibility Program (https://arxiv.org/pdf/2003.12206.pdf), or the TRIPOD Statement (https://bmcmedicine.biomedcentral.com/articles/10.1186/s12916-014-0241-z).

1.2 Full length original research article

Full length original articles should amount to no more than 4000 words, 8 figures and tables, and 50 references. Each of the following sections should be included in the manuscript in this order: Title page, Abstract, Introduction, Method, Results, Discussion, Acknowledgments, Author contributions, Role of the funding source, Conflict of interest, References, Figure legends, each individual Table, each individual Figure. Specific recommendations relating to these manuscript sections follow below.

1.3 Brief report of original research

Brief reports may be submitted for the rapid communication of results of significant interest and novelty. Brief reports should follow the general manuscript format described above, but not exceed an abstract of 250 words, a main text of 2000 words, 15 references, and 2 figures and/or tables.

1.4 Editorial and Commentary

The purpose of an editorial is to stimulate discussion and thought in a brief format. As such, it may contain personal opinion and comment as supported by evidence. Editorials often provide perspectives linked to an article in the same issue. Editorials also provide a forum for the editors to inform readers of updates or changes in editorial policies. Submissions of Editorials are typically invited by the Editors.

The purpose of a Commentary is similar to an Editorial, however these may be unsolicited and need not be invited contributions. They typically involve areas of interest that may be controversial or for which the evidence base is less secure. Authors are encouraged to obtain approval from the Editors prior to submitting Commentaries. Papers accepted as Commentaries may be sent to content authorities in the field to provide short (250 words) responses. These mini-commentaries will be published in conjunction with the original Commentary, and will serve both as "open" peer review and to stimulate discussion in the community.

Editorials and Commentaries should be no longer than 1500 words with a maximum of 2 figures and/or tables and 15 references. Recommendations relating to relevant sections of this article type follow below.

1.5 Narrative Reviews, Systematic reviews and Meta-Analyses'

The suggested word count is 4000, a maximum of 8 tables and/or figures and 100 references. Reviews should include an abstract. Recommendations relating to relevant sections of this manuscript type follow below.

Reviews may come in different formats. The Systematic Review format is preferred wherever possible and appropriate. Systematic reviews and meta-analyses should be reported following the recommendations of the PRISMA statement (http://www.prisma-statement.org) . Osteoarthritis and Cartilage strongly recommends that a completed PRISMA checklist accompanies the submitted manuscript and that the study protocol for a systematic review and meta-analysis is registered in the public database PROSPERO http://www.crd.york.ac.uk/prospero/. Following these recommendations will greatly facilitate the review of manuscripts, decrease the likelihood of multiple revisions, and improve the chances of acceptance for publication.

1.6 Letter to the Editor

Comments regarding articles published in the Journal, or other current matters, are solicited and should be submitted as 'Letter to the Editor'. Such Letters, which should not be original research communications (see Brief Report the appropriate format for such manuscripts), are subject to editorial review. When a published article is subjected to comment or criticism, the authors of that article will be invited to submit a letter of reply.

Letters are no more than 800 words, no abstract, no tables or figures, and maximum 8 references. Recommendations relating to relevant sections of this form of article follow below.

1.7 Supplementary data

Osteoarthritis and Cartilage now accepts electronic supplementary material to support and enhance your scientific research. Supplementary files offer the author additional possibilities to publish supporting applications, movies, animation sequences, high-resolution images, background methods and datasets, sound clips and more. Supplementary files supplied will be published alongside the electronic version of your article, including ScienceDirect: http://www.sciencedirect.com. In order to ensure that your submitted material is directly usable, please ensure that data is provided in one of

our recommended file formats. Authors should submit the material in electronic format together with the article and supply a concise and descriptive caption for each file. For more detailed instructions please visit: https://www.elsevier.com/artwork.

1.8 RESEARCH DATA

This journal encourages and enables you to share data that supports your research publication where appropriate, and enables you to interlink the data with your published articles. Research data refers to the results of observations or experimentation that validate research findings. To facilitate reproducibility and data reuse, this journal also encourages you to share your software, code, models, algorithms, protocols, methods and other useful materials related to the project.

Below are a number of ways in which you can associate data with your article or make a statement about the availability of your data when submitting your manuscript. If you are sharing data in one of these ways, you are encouraged to cite the data in your manuscript and reference list. Please refer to the "References" section for more information about data citation. For more information on depositing, sharing and using research data and other relevant research materials, visit the research data page.

1.8.1 Data linking

If you have made your research data available in a data repository, you can link your article directly to the dataset. Elsevier collaborates with a number of repositories to link articles on ScienceDirect with relevant repositories, giving readers access to underlying data that gives them a better understanding of the research described.

There are different ways to link your datasets to your article.

When available, you can directly link your dataset to your article by providing the relevant information in the submission system. For more information, visit the database linking page .

For supported data repositories a repository banner will automatically appear next to your published article on ScienceDirect.

In addition, you can link to relevant data or entities through identifiers within the text of your manuscript, using the following format: Database: xxxx (e.g., TAIR: AT1G01020; CCDC: 734053; PDB: 1XFN).

1.8.2 Mendeley Data

This journal supports Mendeley Data, enabling you to deposit any research data (including raw and processed data, video, code, software, algorithms, protocols, and methods) associated with your manuscript in a free-to-use, open access repository. Before submitting your article, you can deposit the relevant datasets to Mendeley Data. Please include the DOI of the deposited dataset(s) in your main manuscript file. The datasets will be listed and directly accessible to readers next to your published article online.

For more information, visit the Mendeley Data for journals page.

1.8.3 Data statement

To foster transparency, we encourage you to state the availability of your data in your submission. This may be a requirement of your funding body or institution.

If your data is unavailable to access or unsuitable to post, you will have the opportunity to indicate why during the submission process, for example by stating that the research data is confidential. The statement will appear with your published article on ScienceDirect. For more information, visit the Data statement page.

1.9 Manuscript sections

1.9.1 Title page

Title page should include affiliations and email addresses for each co-author, and full contact details for the corresponding author.

When appropriate include a separate running title.

1.9.2 Abstracts

Abstracts should be no more than 250 words. The abstract should be structured into sections, at least including the following: (1) Objective; (2) Design - if clinical to include setting, selection of patients, details on the intervention, outcome measures, etc.; if laboratory research to include details on materials and methods; (3) Results; (4) Conclusions. For further detail on how to construct an abstract please refer to the guidelines published in the Journal of the American Medical Association (JAMA 2004;291:125-9).

Keywords

Immediately after the abstract, provide a list of 3-6 keywords, using English spelling and avoiding general and plural terms and multiple concepts (avoid, for example, `and?, `of?). Be sparing with abbreviations: only abbreviations firmly established in the field may be eligible. These keywords will be used for indexing purposes.

Running headline

A running title of not more than 40 characters (including spaces), suitable for page headings, should be provided at the bottom of the title page if the full title is longer than 40 characters.

1.9.3 Introduction

Introduction should be brief, to the point, and contain the background that motivated the study. You may assume that the reader is familiar with e.g. the fact than osteoarthritis is a common joint disease, there's no need to repeat that in this journal.

1.9.4 Method

Methods shall contain details relevant to the conduct and interpretation of the study. This includes a description of statistical methods sufficiently detailed so that an investigator with access to the data can verify the results (see section below on statistics). Classification criteria should be reported on patients (where relevant) by a brief description of the clinical features of patients, and by reference to the criteria used. Use of subheadings that aid clarity is encouraged.

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Avoid undue repetition of data in text and tables. Brief comments on the significance of the results is appropriate, but broader aspects of interpretation is reserved for discussion. Use of subheadings to aid clarity is encouraged.

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Wailing HW, Raggatt LJ, Irvine DW, Barmina OY, Toledano JE, Goldring MB, et al. Impairment of the collagenase-3 endocytotic receptor system in cells from patients with osteoarthritis. Osteoarthritis and Cartilage 2003;11:854-63.

2. Corporate Author

FDA Document: Guidelines for industry. The extent of population exposure to assess clinical safety: for drugs intended for long-term treatment of non-life-threatening conditions, ICH-EIA, March 1995; Federal Register March 1, 1995 (60FR11270).

Books

1. Personal Author(s)

Moskowitz RW, Howell DS, Altman RD, Buckwalter JA, and Goldberg VM. Osteoarthritis: Diagnosis and Medical/Surgical Management, Third Edition. Philadelphia, W. B. Saunders 2001.

2. Corporate Author

Drug Information for the Health Care Professional. Volume 1 USP DI. Micromedex, Thomson Health Care. Quebecor World. Taunton, MA, XXII 2002.

3. Editor, Compiler, Chairman as Author

Favus MJ. Primer on the Metabolic Bone Diseases and Disorders of Mineral Metabolism, IV. An official publication of the American Society for Bone and Mineral Research. Lippincott Williams and Wilkins, Philadelphia 1999:1-502.

4. Chapter in Book Lozada CJ, Altman RD. Management of osteoarthritis. In: Arthritis and Allied Conditions, Koopman WJ, Ed. Baltimore: Williams and Wilkins 2001:2246-63.

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