Academy of PHYSICAL MEDICINE

Research Paper Review

This review is published with the permission of Research Review Service (www.researchreviewservice.com)

Documenting female spine motion during coitus with a commentary on the implications for the low back pain patient

European Spine Journal 2014 [EPub ahead of print].

Sidorkewicz N & McGill SM

Reviewed by Dr. Ceara Higgins DC (Research Review Service)

ABSTRACT

Purpose

To describe female lumbar spine motion and posture characteristics during coitus and compare these characteristics across five common coital positions. Exacerbation of low back pain during coital movements and positions is a prevalent issue reported by female low back pain (LBP) patients. To address this problem, the first study to examine lumbar spine biomechanics during coitus was conducted.

Methods

Ten healthy males and females performed coitus in the following pre-selected positions and variations: QUADRUPED (fQUAD1 and fQUAD2 where the female is supporting her upper body with her elbows and hands, respectively), MISSIONARY (fMISS1 and fMISS2 where the female is minimally and more flexed at the hips and knees, respectively), and SIDELYING. An electromagnetic motion capture system was used to measure three-dimensional lumbar spine angles that were normalized to maximum active range of motion-a transmitter and receiver were affixed to the skin overlying the lateral aspect of the pelvis and the spinous process of the twelfth thoracic vertebra, respectively. To determine if each coital position had distinct spine kinematic profiles (i.e., amplitude probability distribution function and total range of lumbar spine motion), separate univariate general linear models followed by Tukey's honestly significant difference post hoc analysis were used. The presentation of coital positions was randomized.

Results

Female lumbar spine movement varied depending on the coital position; both variations of QUADRUPED, fQUAD1 and fQUAD2, were found to use a significantly greater range of spine motion than fMISS2 ($p=0.017$ and $p=0.042$, respectively). With the exception of both variations of MISSIONARY, fMISS1 and fMISS2, the majority of the range of motion used was in extension. These findings are most pertinent to patients with LBP that is exacerbated by motions or postures. Based on the spine kinematic profiles of each

position, the least-to-most recommended positions for a female flexion-intolerant patient are: fMISS2, fMISS1, fQUAD1, fSIDE, and fQUAD2. These recommendations would be contraindicated for the extension-intolerant patient.

Conclusions

The findings provided here may guide the clinician's specific recommendations, including alternative coital positions and/or movement patterns or suggesting a lumbar support, depending on the female LBP patient's specific motion and posture intolerances.

ANALYSIS

Author's Affiliations

Spine Biomechanics Laboratory, Department of Kinesiology, University of Waterloo, Waterloo, ON, Canada.

Background Information

The World Health Organization (WHO) considers the creation and maintenance of a sexual relationship with a partner to be an essential component of their international standard to describe and measure health and disability (1). Additionally, sexual activity is considered a strong indicator of quality of life (2).

Studies have shown that between 48-73% percent of women with low back pain (LBP) report significant reductions in frequency of sexual activity (3, 4). Structured interviews with women with chronic LBP showed that 44% experienced physical discomfort during coitus, while 52% reported restriction of sexual enjoyment due to LBP (3). A further questionnaire-based study showed that 58% of women with chronic LBP had significant discomfort and an exacerbation of LBP during coitus (5). Most commonly, female patients reported difficulties finding a comfortable position and with pelvic movements (5).

The study aimed to describe female lumbar spine motion and posture characteristics during coitus and compare them across five common sexual positions.

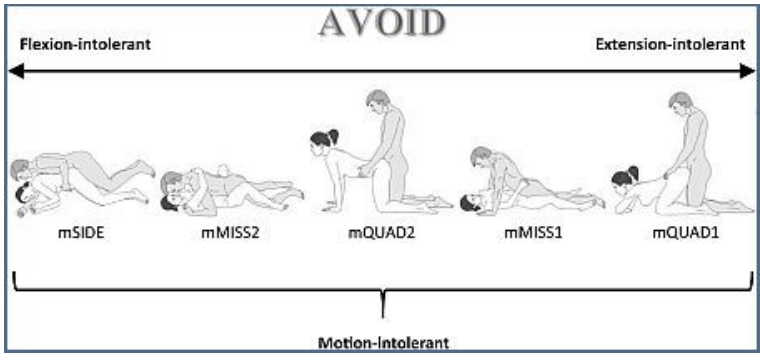
PERTINENT RESULTS

- The majority of kinematic signal was found to be in the sagittal plane (flexion/extension); so all results were based on data in that plane.
- The highest average range of lumbar spine motion in the sagittal plane was found in fQUAD1, followed by fQUAD2, fSIDE, and fMISS1.
- The lowest average range of lumbar spine motion in the sagittal plane was found in fMISS2. fMISS2 showed significantly less lumbar spine motion than fQUAD1 and fQUAD2.
- When amplitude probability distribution function values were compared at 0.0 (the lowest spine angle value achieved), 0.5 (the median spine angle value achieved), and 1.0 (the highest spine angle value achieved), significant differences were found at 0.0 and 1.0. At all three amplitude probabilities fMISS2 was significantly lower than fQUAD1, fQUAD2, and fSIDE. fMISS1 was significantly lower than fQUAD1, fQUAD2, and fSIDE at amplitude probabilities of 0.5 and 1.0 and

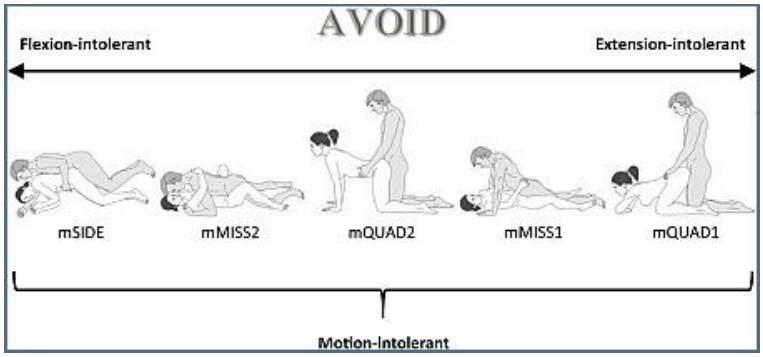
significantly lower than fQUAD2 and fSIDE at an amplitude probability of 0.0. Finally, fQUAD1 was significantly lower than fQUAD2 at an amplitude probability of 0.5.

CLINICAL APPLICATION & CONCLUSIONS

Flexion intolerant patients should avoid both fMISS1 and fMISS2 because the flexion-extension movement of the spine occurs almost entirely in flexion aROM. These patients are likely to do best with fQUAD2 and fSIDE, as spine motion remains in extension in these positions. In extension intolerant patients, the opposite would be true. This is summarized in the image below.



Although it was assumed that the female spine would remain relatively kinematically stable due to the use of male-centric positions, in actuality the kinematics were cyclical. Therefore, although less spine motion was seen in fMISS2, there was still too much motion and no position was truly spine-sparing for the motion-intolerant female patient. However, it may still be helpful to recommend positions requiring less motion and to coach patients to use more hip- and/or knee-hinging techniques during coitus to reduce impact on the spine (9, 10).



As always, interventions must be tailored to the couple and may include not only advising alternative coital positions and/or alternative movement patterns, but also recommending proper lumbar support. It is important for clinicians to be prepared to participate in dialog with their patients about this important issue.

Study Methods:

Ten healthy males and ten healthy females with 4.7 (plus or minus 3.9) years of sexual experience with

one another were recruited and asked to perform 5 different coital positions (presented in random order) in the lab while observed by an electromagnetic motion capture system. Each position was performed for 20 seconds and participants were asked to move as naturally as possible.

Inclusion criteria:

- No history of spinal, abdominal, or hip surgery
- No pre-existing disabling back or hip conditions
- No relevant musculoskeletal conditions
- No sexual dysfunction that would prevent them in participating in coitus for the duration of data collection
- No registered student status at the university

Coital positions were chosen based on qualitative research identifying common coital positions for patients with LBP (3, 5, 6) and positions that are commonly recommended to individuals with LBP (7) as well as a biomechanical rationale. The positions included were:

1. Quadruped variant 1 – Rear-entry with the female in the quadruped position and the male kneeling behind her. The female supports her upper body with her elbows (mQUAD1)
2. Quadruped variant 2 – As above with the female supporting her upper body with her hands (mQUAD2)
3. Missionary variant 1 – Front-entry with the female lying supine and the male prone on top of her. The male supports his upper body with his hands and the female is minimally flexed at the hip and knees (mMISS1)
4. Missionary variant 2 – As above with the male supporting his upper body with his elbows and the female flexed at the hips and knees (mMISS2)
5. Sidelying – Rear-entry with the female laying on her left side and the male laying on his left side behind her with their hips and knees flexed (mSIDE)

At the end of all coitus trials active range of motion (aROM) of the lumbar spine was measured for each participant in flexion, extension, bilateral lateral flexion, and bilateral rotation. The assumption was made that this represented each participant's maximum range of lumbar spine motion.

Motion of the torso and pelvis was collected using an electromagnetic motion capture system. The system consisted of a camera-less system that uses a transmitter generating a varying electromagnetic field and a receiver to sense the field. The transmitter was affixed to the skin overlying the lateral aspect of the pelvis on the right side and the receiver was affixed to the spinous process of the twelfth thoracic vertebra using adhesive tape and fabric hook-and-loop fasteners.

Kinematic data was normalized and outcome measures calculated using a custom computer program in MATLAB software. All measurements were then normalized to their respective maximum aROM trials. Next, amplitude probability distribution function (APDF) was calculated for each position. This indicates the probability that the spine angle is less than or equal to the maximal spine angle value during a coitus trial (8). Finally, spinal flexion and extension was placed on an APDF curve where the total aROM for the lumbar spine falls on a 200-point scale (Flexion being between 0 and -100% and extension between 0 and +100%).

The independent variable in the study was coital position and the dependent variables were the 3D

lumbar spine angular displacements at amplitude probabilities of 0.0, 0.5, and 1.0 and the range of spinal motion in the sagittal plane.

STUDY STRENGTHS / WEAKNESSES

Strengths

- Pilot testing confirmed the absence of substantial artifact due to soft tissue movement or contact between the receiver and the mattress.
- Robust data analysis was performed.
- The study fills an important void in the research as many clinicians are unsure of how to counsel their patients with regard to coitus, but are aware of the significant impact sexual activity can have on quality of life.
- This study proves that further research into the biomechanics of coitus, including recruitment of couples willing to partake in coitus in a laboratory setting, is feasible.

Weaknesses

- The study data is most pertinent to individuals with LBP exacerbated by motions in the sagittal plane. However, we should remember that the study examined spine mechanics in a sample with no pre-existing, disabling back or hip conditions. This may limit the external validity of this study for clinical populations.
- The electromagnetic motion capture system that was used for this study has a few limitations including the need to restrict metallic objects in the electromagnetic field as they may affect the accuracy of the system. In this study the use of mattresses with metal coilsprings was of concern. However, pilot testing did not indicate any issue with testing accuracy in this case.
- The current study was limited to females – but a companion paper on females has been published and reviewed.

Additional References

1. International Classification of Functioning, Disability and Health (ICF). World Health Organization (WHO) website. http://apps.who.int/classifications/icfbrowser/. 2001. Accessed 9 Apr 2011.
2. Stock SR, Cole DC, Tugwell P, et al. Review of applicability of existing functional status measures to the study of workers with musculoskeletal disorders of the neck and upper limb. American Journal of Industrial Medicine. 1996;29:679-688
3. Sjogren K, Fugl-Meyer AR. Chronic back pain and sexuality. International Rehabilitation Medicine. 1981;3:19-25
4. Akbas NB, Dalbayrak S, Kulcu DG, Yilmaz M, et al. Assessment of sexual dysfunction before and after surgery for lumbar disc herniation. Journal of Neurosurgery: Spine. 2010;13(5):581-586
5. Maigne J, Chatellier G. Assessment of sexual activity in patients with back pain compared with patients with neck pain. Clinical Orthopaedics and Related Research. 2001;386:82-87
6. Monga TN, Monga U, Tan G, et al. Coital positions and sexual functioning in patients with chronic pain. Sexuality and Disability. 1999;17:287-297
7. White AA, Panjabi MM. Clinical Biomechanics of the Spine. 2nd ed. Philadelphia, PA: J.B.

Lippincott Company; 1990
8. Hagberg M. The amplitude distribution of surface EMG in static and intermittent static muscular performace. European Journal of Applied Physiology. 1979;40:265-272
9. McGill SM. Low back disorders. 2nd ed. Champaign, IL; Human Kinetics;2007
10. Ikeda DM, McGill SM. Can altering motions, postures, and loads provide immediate low back pain relief: a study of 4 cases investigating spine load, posture, and stability. Spine. 2012;37(23):E1469-E1475