Evaluating the use of the Bambach Saddle Seat to enhance functional outcomes in a disabled client group

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Abstract

The aim of this study was to determine if the Bambach Saddle Seat would enhance functional outcomes for clients with task seating difficulties. The literature supports that the design of this chair is based on sound ergonomic principles. Fifteen participants aged 8-53 years with a range of disabilities trialed the Bambach Saddle Seat. They completed pre and post trial questionnaires relating to functional outcomes in posture, sitting tolerance, attention and concentration, upper limb function, pain, kinesthetic awareness and access. The results were statistically significant, and demonstrated that this chair should be considered for trial as a task seat.

Introduction

Occupational Therapists working in a range of therapeutic settings are often asked to assist with task
seating difficulties that are impacting on their client's ability to achieve Occupational Performance goals. The Bambach Saddle Seat when trialed with a range of clients resulted in outstanding anecdotal evidence. As Evidence Based Practice suggests, it is inappropriate to use personal experience or opinions to guide professional recommendations (Cusick, & McCluskey, 2000).

Ergonomists and therapists, acknowledging the importance of the role of the pelvis in upright sitting, have dedicated much research into this area. It is now accepted that forward tilt seating promotes a better sitting posture in that the natural lumbar curve is more easily maintained and disc pressure is minimised (Keegan, 1953; Andersson et al, 1974; Mandal, 1981; Lelong, 1988; Bridger, 1992). However the fact remains that sitting is a static posture. Static sitting posture is well known to have it's own inherent dangers which include fatigue, pain, and ultimately injury (Arras, 1987).

Reissner (1972) defined that sitting needed to be a dynamic activity. He concluded that this was a posture where the hip angle was 130 degrees, the feet resting on the floor with the pelvis stable and allowing many small movements of the spine. Rheumatologists have long advocated that this position is necessary to provide intervertebral discs with nutrition for good spinal health (Holms & Nachemson, 1983). This pelvic stability is also necessary for upper limb stability, which is required for good upper limb control. The need for good sitting posture is further reinforced when we consider that slumped sitting is not only tiring in the

short term, but also the possible cause of various forms of wear and tear on the spine (Raff, 1998). If we habitually sit slumped, an imbalance in the muscle fibre mix occurs (Cram & Vinitzky, 1995), the implications then being that we have the strength to sit upright for short periods of time only, after which we fatigue and slump (Garlick, 1998). This would seem increasingly important where it has been identified that lumbar fatigue impairs the ability to sense a change in lumbar position, where this perception of trunk position and motion is essential for correct placement of the trunk with all activity (Taimela et al, 1999). According to Bills (1943), by decreasing the fatigue of the spinal muscles, there will also be a decrease of subjective fatigue, such as the psychological factors of motivation and alertness, and then objective fatigue which is manifested by a decline in task productivity. The last manifestation of fatigue is seen as physiological fatigue, which is characterised by changes in physiological processes resulting in pain.

Cram and Vinitzky's (1995) EMG studies into the effect of chair design and back muscle fatigue showed that even with tilt seating, significant levels of recruitment to stabilise the pelvis and spine created muscle fatigue problems. These were as great as the standard chair design, yet the correct lumbar curves and decreased disc pressure were maintained. In reviewing a sitting aid that mechanically stabilised the pelvis in a standard chair, they found that the more one sits in a chair that offers mechanical support to the pelvis and lower spine, the less supplemental muscular effort is required to perform a sitting task (Cram & Vinsky, 1995). Further EMG and posture analysis studies of seat shape found that when a modified seat shaped was trialed where the design included concave shaping under the ischial tuberosities as well as downward slope of 18%, this produced lower overall lumbar muscle activity. The subjects also recorded the greatest numbers of postural changes (Graf et al, 1993). It would seem that although the Bambach Saddle Seat is not a mechanical aid to control pelvic stability, it utilises it's saddle seat shape to control the pelvis, and the necessary stability for optimal spinal muscle activity is achieved (Verkindore et al 1998). This is also supported by earlier studies on the chair carried out by the designer, demonstrating that lumbar lordosis can be maintained for longer periods of time than in a standard chair (Gale et al, 1989).

The literature indicates that the design of the Bambach Saddle Seat appears to be based on sound ergonomic principles. The literature allows us to assume that if we can decrease the fatigue in the spinal muscles through an improved posture, we will see an improvement in functional performance.

Our first question: Will the Bambach Saddle Seat demonstrate improvements in sitting posture, sitting tolerance, attention and concentration, pain, and ability to perform upper limb activities, regardless of subject age, gender, or disability?

Our second question: Will users of the Bambach Saddle Seat develop an enhanced kinesthetic awareness of what "good" posture feels like?

Our third question: Is the Bambach Saddle Seat a practical choice of seating in the users own environment with respect to the ease of getting on and off the chair?

Method

Participants

There were 15 participants (6 female and 9 male) in the study aged 8-53 years. They were not randomly selected. The inclusion criteria for selecting suitable participants for the study were that they must first have good upper trunk control, and they must be demonstrating difficulties with task performance in their work environment. The disabilities were broad and included, Cerebral Palsy, Ankylosing spondylitis, muscular atrophy, low muscle tone, chronic neck and back pain. The work tasks and heights were varied.

Materials

A pre and post trial client centered self-report measure was designed using a 5 point likert scale where 1 = no problem, and 5 = significant problems as the use of a self report measure is recognized as a valid means of assessing change in functional performance (Beattie & Maher, 1997). Six questions looked at changes in posture, sitting tolerance, concentration, pain, upper limb abilities and ability to get on and off the chair. The last question was asked to evaluate the participants' own kinesthetic awareness of what ""good" sitting feels like. This required a yes/no response. A comment section was included after all questions. The pre-trial chairs were varied. The trial chair was a Bambach Saddle Seat with a back support, a sheepskin cover, a hydraulic stem with a 5 star base and castors. It is recommended for use at desk heights from 650-800mm. Small children were given a short hydraulic stem. This option allows for access to even lower desk heights.

Procedure

All participants identified for participation in the study were sent an information package in the mail. This package included a consent form, pre trial questionnaire, and instructions On how to complete the questionnaires. The chair came with a "How to Use" brochure and an instructional video. After a minimum trial of six weeks the post-trial questionnaire was sent for completion. Participants were encouraged to adjust the chair height for comfort and desk height demands. Verkinodore's 1998 study found that when clients adjusted the height for comfort, the average height was 540mm. The chair height was not measured. The recommended hip thigh angle of 130 degrees as was not measured.

Results

The results were analysed using the SPSS version 10 statistical package. The sample was small, and did not meet any of the assumptions for parametric statistical studies. As the mean and median scores obtained from the questionnaire variables were numerically close enough, we were advised we could use parametric statistics. The results should be interpreted with caution.

Quantitative

The average change score on all questions was an improvement rating of 2 levels, except for the question with regard to access on and off the chair where the improvement rating was 1. T-tests using mean change in recorded responses on a 1-5 scale were carried out to determine significance between the paired samples. All questions resulted in a decrease in

recorded response that indicated a lower level of problem perceived post trial. See Table 1 and 2.

Table 1. Numbers of participants and the ratings recorded in pre (before) and post (after) questionnaires against all rated questions

	Q1		Q2		Q3		Q4		Q5		Q6	
Rating of problems	Before sit post	After sit post	Before sit tol	After sit tol	Before attent concen	After attent concen	Before upper limb	After upper limb	Before re pain	After re pain	Before on/off	After on/off
1 = no problems		12		5	1	13	2	13	2	11	7	11
2	1	3	1	5	2	1	1	1	1	2	4	4
3 = some problems	7		3	3	6	1	6	1	6	2	2	
4	2		6		5		4		4		1	
5 = significant problems	5		5	2	1		2		2		1	

Table 2. Level of significance in relation to mean change recorded

	Q1	Q2	Q3	Q4	Q5	Q6
Mean change recorded	2.53	1.73	2.00	2.00	1.80	.73
Level of significance	p<.001	p<.05	p<.001	p<.001	p<.001	

On the 7th Question relating to Kinesthetic Awareness, in the pre trial question, 3 recorded a Yes, they did feel that they were able to sit correctly in their chair. In the post-trial questionnaire 14 participants recorded a Yes.

Qualitative:

The following comments were noted:

Chair restriction maintains posture; sits more upright; corrected usual slouched posture; some pain from the saddle; improved posture/less fatigue; better concentration; less pain/less distracted; corrected posture/tasks easier to perform; original pain improved but now sore bottom from saddle; posture always correct; back automatically straightens.

Discussion

The change in sitting posture reported was highly significant. It is worth noting that in the post trial question, 12 of the 15 participants recorded “no problems”. In evaluating the comments it was evident that in trialing the chair, participants reported an overall

improvement in slumped and sagging postures. The statistically significant improvement in posture after using the chair, combined with the comments, supports the evidence in the literature that the principles of pelvic tilt and dynamic seating enhance natural spinal curves, and good seating (Keegan, 1953; Mandal, 1981, Bridger et al 1992).

The change in sitting tolerance reported was also significant. Graf et al, 1993 in looking at seat shape design concluded that tilt seating alone is not adequate in improving postural control. Evidence in the literature supports the fact that supplemental mechanical control of the pelvis such as is provided with the saddle, in conjunction with tilt seating is important in reducing fatigue of the spinal muscles (Cram and Vinitzky, 1995), therefore improving sitting tolerance. Despite the statistical significance found in our study, 5 of the participants still reported post trial difficulties. Two of these 5 participants recorded a reduction in sitting tolerance. In evaluating the comments made by these participants, it would appear that the reduction in tolerance was not related to their original disability but to new pains directly related to the hardness or the depth of the seat. As we know, the comfort factor of a chair is an important consideration for client's ultimate choice of a chair as a task seating option.

The change in attention and concentration reported was highly significant. After trialing the Bambach Saddle Seat, 13 participants recorded no problems. The comments made by participants indicated that the improved posture resulted in less effort to sit less fatigue and less pain, which resulted in an improvement in concentration. This is clearly supported in the literature with Bills classification of Fatigue (Bills, 1943).

The change in upper limb activity reported was highly significant. The unique design of the Bambach Saddle Seat is designed to provide pelvic stability. This pelvic stability is seen to be necessary to allow for dynamic spinal movements (Reissner, 1972). This enables the user both easy access to the desk in that movement occurs at the hip without the characteristic slouching so often seen in other chairs, and facilitates the pelvic stability necessary for good upper limb movement for desktop tasks. Participant's comments indicated that they believed that their upper limb performance was enhanced by their improved posture.

The change in pain reported was also highly significant. After trialing the Bambach Saddle Seat, 11 of the 15 participants reported no problems. It is reasonable to assume that once again the reduction in fatigue in the spinal muscles has resulted in a reduction in the physiological changes such as pain. (Bills, 1943). The need to review the comfort factor of the chair has been highlighted again as a limiting factor to the acceptance of the chair with some clients.

In looking at ease of getting on and off the Bambach Saddle Seat to evaluate whether it was a practical choice of seating, the responses on the question indicated that the change reported was not significant, though an improvement in rating was noted. The post trial responses indicated that participants did not find the unusual design of the chair to present any real problems with getting on and off the chair in a desktop setting, with 11 recording no problem.

In relation to the question regarding the Bambach Saddle Seats' ability to enhance awareness of what good posture feels like, 12 of the participants reported an improvement

in their ability to perceive change in what good posture feels like. However, the results cannot be seen to be conclusive. One cannot be sure that participating in therapy, or being instructed on how to sit in the chair, did not impact on their knowledge base. However our study has shown that the ability for participants to sit correctly for longer is enhanced in the Bambach Saddle Seat. This allows participants to learn and recognise the correct patterns of body position to facilitate better performance. (Raff, 1998). It is therefore reasonable to assume that the use of the Bambach Saddle Seat is likely to result in some improvement in kinesthetic awareness.

Conclusions

Even though we must interpret the results with caution, the results of this study appear to indicate that the Bambach Saddle Seat should be considered for trial with all clients who present to therapists with difficulties with sitting posture, sitting tolerance, concentration and attention, pain and upper limb function. This study indicates that improvements in these areas are likely to be demonstrated regardless of age, gender or disability. Further research using a random selection process with larger numbers may be useful to determine if results can be duplicated.

However in choosing the Bambach Saddle Seat as a chair to trial, initial discomfort can at times be experienced by the user. The designer of the chair recommends that for the first 2 weeks, the user should sit for no more than a couple of hours per day. Our study suggests that there may be some concerns with regards to the ongoing comfort factor of the chair. It would seem appropriate that further investigations of the comfort factor of this chair should be done.

Therapists who are working with clients on kinesthetic awareness problems, may like to consider using the Bambach Saddle Seat as a therapy tool, due to the indications that it helps to facilitate an improvement in this area.

The appeal of the Bambach Saddle Seat for therapists appears to be in its versatility, in that it can be applied to a diverse disabled client group of any age regardless of work tasks demands or task heights. Also it appears that the chair not only reinforces good posture but aids in the correction of poor postural habits.

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