Reviewer's report

Title: SEAS (Scientific Exercises Approach to Scoliosis): a modern and effective evidence based approach to physiotherapeutic specific scoliosis exercises

Version: 5 Date: 20 May 2014

Reviewer: Eric Parent

Reviewer's report:

This thematic series article remains a description of a scoliosis specific exercise approach for Scoliosis. The invitation from other reviewers to submit a more detailed review was not followed. This is consistent with other paper in this thematic series but there would be interest for more details.

1. Is the question posed by the authors new and well defined?
   This is a description of the exercise approach and as such the intent is clear. I wish it also included more details on the literature review.

2. Are the methods appropriate and well described, and are sufficient details provided to replicate the work?
   More details have been provided on exercise dosage and prescription strategy. However the evaluation remains insufficiently described.

3. Are the data sound and well controlled?
   --There are no research results presented that are new for this thematic series article.

4. Does the manuscript adhere to the relevant standards for reporting and data deposition?
   -description of approaches don’t match a clear typical reporting format I am familiar with the flow is ok but I make a few suggestions below..

5. Are the discussion and conclusions well balanced and adequately supported by the data?
   - This does not really apply in this case. Authors added a conclusion

6. Do the title and abstract accurately convey what has been found?
   -Yes

7. Is the writing acceptable?
   The paper has been significantly reviewed improved for English language throughout. I make some additional recommendations but English is a second language for me as well.

   • Major Compulsory Revisions (which the author must respond to before a
1. In the abstract: I continue to recommend adding the following key characteristics to the rehabilitation program section: Patients for which the approach is indicated;

If it is for all patients with AIS including before and during bracing and before and after surgery as your response to my comment suggest I would like to see that in the paper. It could be framed in terms of whether it is consistent or goes beyond the SOSORT guidelines recommendations. If you suggest everyone with scoliosis does SEAS exercises then it should be specified. IF the approach remains the same whether it is combined with bracing or pre or post bracing or surgery it should be specified. It would clearly specify what SEAS proposes and the reader could judge whether it is consistent with the SOSORT and SRS guidelines. Surgeons if interested in prescribing SEAS would surely want to know when it is indicated and for which subgroups of patients with scoliosis there is evidence of effectiveness alone or in combinations with other therapies.

2. I would like to see a specific description of discharge criteria (of discontinuation of the therapy. (Specify duration in terms of months, years or in relation to skeletal maturity; session durations). You response to my comment was : The treatment ends when the situation of the patient is enough stable. (Specify in the the text how this is determined) When the probability of worsening is controlled. (specify how this is appraised in the text).

3. My comment from the previous review has not been addressed. Intro paragraph 1: You refer to most-qualified. I suggest you replace by specialized. I suggest to simply list the specific centers having influenced the developers via as you now suggest exchange of information and experiences. Please refer to specific centers or Clinicians/ researchers having had influence. Similarly On page 2 I recommend deleting the sentence “Which in those days was considered one of Europe’s most prestigious center for scoliosis treatment.” I would start the text sentence. The Centre des Massues attracted a large number of patients who came from abroad and had presented on scientific evidences of conservative treatment based on the use of braces (Provide citations otherwise rephrase to avoid reference to the scientific evidence.)


5. The following comment remains not adequately assessed: “The SEAS evaluation description should be more specific. SEAS’s prescription is directly related to the assessment.” A clear description of the assessment strategy is therefore very important. Without having to detail all tests as in a manual, you could specify “How long is the evaluation? How does the therapist pick the most relevant elements from the broad list of evaluation tests listed? Specify if there is guidance (For example explain the training provided to do this evaluations) on which tests to use. How do the therapist weight the information retrieved: eg flexibility, vs balance vs strength…? The decision of the few exercise prescribed is tied directly to evaluation findings. The reader needs to understand how the
evaluation is planned and interpreted. Specifically, how do you assess the balance and the coordination of patients? (these are elements of most SEAS exercises I have come across to date. A colleagues suggested that the scoliosis manager tools may also help guide the evaluations. If that is the case please explain.

6. Please explain how a therapist is to decide on how to progress the patients to the next exercises. This would address “ How are decisions made every 3 months to change an exercises or progress its difficulty? Are certain impairment targeted before others? (Does SEAS challenge flexiblity before strength, before endurance before balance control....”

7. Please clarify how the therapist is choosing the main self-correction elements. When trying to go easy how is the therapist choosing which are the priority self-correction and which are the corrections that can wait to a later time? If it is simply whether the patient can do an adequate self-correction in the prescribed direction but not in the other directions after initial session then please say so in the text. Without providing more details it is hard for the reader to understand how SEAS is implemented and different from other methods using self-corrections. Simply listing factors considered to influence the therapists selection of the priority correction may be good.

8. This comment has not yet been addressed: P10. I agree with the authors that it is not a necessary element of the thematic series but many reviewers have asked for this section and I leave it to the editor to emphasize this request or not. I suggest if this is to be expanded that the results of the literature section is too vague. One of the most valuable part of the paper will be the inventory of the studies so far on SEAS. It would likely increase the number of citations. I suggest creating a summary table for these studies. For each it should be clear which were the patients included (clarify the age, gender, skeletal maturity, curve types and severity), Describe BOTH treatments compared (type, overall duration, number of sessions, home program) Specify the targeted outcomes (report main results providing information to judge both the clinical and statistical significance.), specify the study designs. Other reviewers have asked for this as well and I will suggest this be possible to the editor.

• Minor Essential Revisions (such as missing labels on figures, or the wrong use of a term, which the author can be trusted to correct)

• I acknowledge my suggestion to define spinal collapse may have been school specific. On Page 3 I now suggest: (Tendancy for the evolutive scoliotic spine to lose height as it bends and twists over time).

1. Abstract In background: I suggest deleting the part and rewording to keep the focus on how changes are made rather than how they are NOT made: “The changes to the approach are based on the gradual introduction of new knowledge gleaned from the scientific literature.”

2. Abstract in Rehab Program: I suggest: “… evaluation tests guiding the choice of the exercises most appropriate...”
3. Abstract in rehab program: I believe difficult period may be excessive given the data on quality of life in patients with small curves. Maybe difficult may require qualification. EG is ensuring compliance sometimes difficult? Please specify.

4. Abstract in rehab program: I suggest: “so as to stimulate a self-corrected posture during…” Throughout the text when self-correction has been used to described the fact that corrections have been applied to a posture I recommend self-corrected posture rather than self-correction posture.

5. Abstract In rehab program. I suggest: “.... Sessions are carried out by an expert physiotherapist. The patient repeats his home exercise program for two or three 45-minute sessions…”

6. Abstract in rehab program. I suggest adding a sentence about discharge criteria or about when the exercise therapy ends.

7. In the abstract and the text P14 . Please refer to the published articles in peer-reviewed journal and abstracts directly without emphasizing the indexing in only PubMed. This is overly restrictive and while there is a correlation between quality and indexing in pubmed this call to authority does not contribute to show the quality of SEAS beyond peer-review publications with specific citations provided. More interesting would be to specify in which treatment phases the SEAS approach is supported by evidence among the following: used alone in small curves?, used pre brace to avoid bracing?, used pre-brace to improve brace effects? Use in brace to improve brace effects?, Use pre surgery to avoid Surgery or improve achievable correction and recovery?, Used post surgery to avoid adding on or continued progression or avoid pain?.

8. Abstract results: I suggest: “... the SEAS excercises have been shown effective in slowing…”

9. Abstract conclusion: I suggest to clarify what you mean by “modern neurophysiological basis to reduce requirements for patients …”. If you mean reduce therapy dose I suggest: “… modern neurophysiological basis to reduce the recommended frequency of visit and daily exercises durations for…”

10. Abstract conclusion: Your statement “Even if SEAS appears to be superficial” is too vague. Maybe emphasize even if it appears simple by requiring less therapist supervision and by using fewer home exercises prescribed at a lower dose that some of the other scoliosis-specific exercise approaches.

11. Theoretical principles P3 I suggest: “Lyonese Approach [1-2], some of the base characteristics previously published for the Lyonese approach have been retained in SEAS:  
- Increasing patient’s awareness of the deformity;  
- emphasising an independent auto-correction by the patient;  
- use of exercises in which balance reactions are elicited;  
- ensuring that the patient wears a brace for at least some of the exercises, so as to use.....”

12. P3 Under stabilisation: I question the suggestion that braces are used to
pursue progressive rigidity. I suggest: “... who use a brace to use the passive support of the spine to provide improved spinal alignment promoting symmetrical growth thereby preventing curve progression until skeletal maturity.

13. P3 Under stabilization: I suggest: “Meanwhile, those who use exercises endeavor to improve the function of stabilizing muscles in order to counteract curve progression.” This wording could address the issues with Spinal collapse and the need to define the latter. Otherwise please correct (the loss of the alignment) Rather than lost.

14. I suggest at the top of P4: “In the SEAS approach, the improvement of the ability to maintain stability with active self-correction is the primary objective.

15. P4 Under SEAS: I suggest: “with this purpose in mind, some very challenging treatment approaches require exercise sessions... beyond those sessions with the passive support of props or the constant feedback of a therapist. “

16. P4 under SEAS: I suggest:” ... train automatic response for the achievement of a more correct position [14] so as to stimulate the maintenance…”

17. P4 Under SEAS: I suggest: “... contraction of muscles trained for maintaining the best available alignment of the spine given the characteristics and ability of the patient. “

18. P5 Under SEAS I suggest: “...significant immediate improvement of the aesthetic of the torso by improved symmetry.” “-Improvement of the frontal balance and weight distribution within the spine an through the peripheral joints.” “- Improvement of the postural alignment of other body parts (eg. Head, elbows).

19. P5 Correct in 2 under SEAS exercises: impairments for impairments

20. P5 under SEAS Exercises: I suggest: “... to train the automatic response to maintain optimal alignment through the widest possibly array of challenge activities.”

21. P5 I suggest last sentence under SEAS exercises: “... “distraction” that challenges the ability to maintain the self-correction.”

22. P6 Under objective 2 L4: I suggest: “... for the classification of additional impairments (strength....” I would recommend avoiding the etc. as it is too vague. I would like you to report how the evaluations tests are to be chosen. How are SEAS therapists trained to plan their evaluation?

23. P6 under objective 2 L7: I suggest: “The information is used to guide the selection of the exercises to improve any ...” The example listed at the end of the sentence is interesting but I continue to wonder how the impairments detected are ordered as priority in the planning of the therapy. This is necessary for me to be able to believe that two different therapists would practice SEAS similarly. For example are balance issues always a priority. Or do you always address flexibility in a preparatory phase as it may be the case with FITS ...??

24. P7 Top: I suggest: “In the SEAS approach,... “ Please also fix the line break on line 2.

25. P7 Under first question: L1 I suggest: “... the exercises always start from a position where the spine has an adequate base of support. “
26. P7 under first question: L6-7. Please clarify what you mean by “and not in normal and relaxed position?

27. P7 Under second question: L1 I suggest: “ ... the patient asks a second…”

28. P7 Bottom line: I suggest: “ ... The exercise challenging my ability to maintain autocorrection, am I able to maintain the self-corrected posture?

29. P8 Line 3. Please fix the line break.

30. P8 Under fourth question, L2: I suggest “ The question the patient asks now is... the exercise challenging may self-correction and my natural position?”

31. P8 Under Fourth question Line 6: I suggest: “ .. is the one where the shifting of the body mass... the active corrective movements.”

32. P8 under Fourth question: 8-9 I suggest: “ ... the self-corrected posture had been lost and the the performed challenging exercise had led to the loss of the corrected characteristics and had become a simple gymnastic exercise. “ Here I would like you to spell out the therapeutic implications for the therapist decision making if the patients answers no at this point. Would a different exercise be prescribed?

33. P8 Under Learning self-correction:L 3 I suggest;” ... composed of movements performed in all spatial planes... together with an upward vertically directed movement...”

34. P8 under self-correction L5: Please explain how the patient learns. What are the cues and the feedback strategies employed.

35. P8 Under learning self-correction: L7 : I suggest “… Aims to reduce the curvature’s Cobb angles. It is always performed obliquely upwards, to reduce the severity of the curve and to counteract postural collapse.

36. P8 second last line: I suggest: “... and aims to reduce spine torsion. ...”

37. P9 L1 I suggest: “… active self-correction, the patient follows ... stays active to recover his /her relaxed posture... caudal area, i.e. first the patient corrects the lumbar...”.

38. P9 A discussion or a rationale section nearby should be added to justify why you propose the instructions (caudal first, sagittal first) in the first 3 bullets. I would like to have the rationale explained to the reader. What did experience teach you. (is it easier?, Are there more compensation otherwise?....)

39. P9 L18. I suggest: “ It is true that the visual control... neurological fibers providing sensory information about the trunk position in space... linked to sight, but to proprioception.

40. P9 L22. Clarify what is meant by targets here.

41. P9L22 I suggest: “ ... of self-correction, without using visual feedback.”

42. P9L23 I suggest: “ ...initial phase, but its use should be eliminated…”

43. P9L26 I suggest: “...control of the most specific proprioceptive fibers. “.

44. P10 L4 I suggest: “… while keeping an active self-correction...”
45. P10 L5 I suggest: “... quietly in a self-corrected position.”

46. P10L8 Please explain how detection of fatigue would influence the dosage of the exercises. How does fatigue detection translate in instructions to the patient to decide how much of an exercise to do.

47. P10 L9 I suggest: “Examples of the sequence of actions for two SEAS exercises.”

48. P10 L11 I suggest: “... the self-correction in the frontal plane.

49. P10 L12: I suggest “... while preserving the self-corrected posture...”

50. I believe something is wrong in the following sentence: “... the correction of the right thoraco lumbar curve (the patients looks like it may be a single thoracic curve to the right?) with a lateral translation (delete slanted) towards the upper part of the thoraco-lumbar section towards the convex side (Should this be concave? Translating towards the convex side would worsen the aesthetics???

51. P10 L19 I suggest: “... maintains the corrected posture”

52. P10 L20 Plase explain how the subjects it to determine the number of repetitions for performing this exercise? Is it to be performed until some symptoms are detected or until the patients answers not to some of the questions?

53. P10 L22 I suggest: “... elbows and pushing back in order to return... keeping the self-corrected position during the exercise. ... perform the exercise repetitively for approximately 10 seconds. (Or is it one repletion over 10 seconds?).

54. P10 L24. Please explain how it was chosen to perform the self-correction only in the horizontal and sagittal planes for this patient? Did you try to correct in all planes by this were the two planes where the correction was adequate to focus on. Given an imperfect self-correction in all three planes, how does a SEAS therapist decides on which plane to not focus on initially? Are there guiding principles to select which corrections are emphasized or not?

55. P10 last line. I suggest: “... at approximately an 80 cm distance”

56. P11 L1 I suggest: “... the thoracic self-correction in the horizontal ...”

57. P11 L5 I suggest: “... the pushes back with the arms”

58. P11 L6 I suggest: “... losing the self-corrected posture”

59. P11L7 I fail to understand why it is necessary to constantly teach the patient to relax to the noncorrected posture after each exercise given you want to train a new motor control pattern. Wouldn’t it be counterproductive to constantly bring back the patient to a non-corrected posture? Would there be a risk that they actually go actively into the collapse posture to illustrate that they had done the exercises adequately?. When you introduce the relevant question for this relaxation it would be relevant to explain how this relaxation guide treatment planning (selection of exercises, progression in difficulty to really make sure it is justified?)

60. In the overview of the protocol. Discuss a range of how long is devoted to the
evaluation, the teaching and the counselling during the 1.5 hr session. Here or in a separate section, please describe who is involved in delivering the SEAS therapy and their qualification process. Is it the physiotherapist doing all 3 parts of are different specialists involved. If other specialist please specify who they are in terms of professional qualifications.

61. Consider adding as paragraph or a few sentence to explain the topics covered in counselling and how it is done. I understand this may vary but I would suspect that there are dominant topics addressed. Since this counselling is fairly unique to SEAS. It would be valuable to introduce it in more details in this paper.

62. P11 Under protocol Line 7. I suggest: “... by an expert physical therapist. ...a DVD or USB memory media while...”

63. P11 Under protocol Line 10 Please fix the line break.

64. P11 Under protocol line 13. I suggest: “… following up with six to eight patients...”. In this sentence you suggest that exercises are all changes in group sessions please explain how? And from what to what. If you are suggesting that exercises are not modified in the group setting and that instead changes are made when the patients are seen one on one then please rephrase.

65. P11 3 lines form the end. Please define together when you say “possible to have two sessions togther every six months.”. In the following sentence please change autonomously by independently.

66. P12 Par 3 l1. I suggest: “… the muscle response that the corrective exercises should elicit is of a tonic type.”

67. P12 Par 3 L3 I suggest: “… influence the ability to control posture. “

68. P12 Par 4 L3 I suggest: “… postural combinations. Consequently, … posture, using postural challenges determined by the patient’s needs in daily life.

69. P13L1 I suggest: “… neurological feedback systems concerning…” or sensory systems.

70. P13 L10 I suggest: “… that helps choose the … the subject’s appearance.” Or posture?

71. P13 L13. I suggest to avoid using etc and instead explain how deficiencies are detected or complete the list. I suggest also: “… to integrate the self-correction program with…”

72. P13 Under Strengths Line 4 I suggest: “… also by the patient’s self-correction performance capacity.”

73. P14 L1. I suggest to explain how the adaption to the patient’s ability is done: “… such that effective self-correction is always visible before the relaxation phase of each exercises.

74. P14 19-20 The terms characteristics on these two lines are vague. Please explain with possibly a link to the evaluation findings.

75. P15 L1 please add the reference to the study reducing the rate of brace prescription to the sentence ending with the word prescription.
76. P15 l3. I suggest: “... difference in the proportion of failure of treatment favoring those treated with SEAS exercises compared to those who...”

77. P15 L17 I suggest: “... Different rate of bracing in patients from two...”

78. P15 L5 from the bottom. I suggest: “... to be useful for counteracting or preventing the evolution of scoliosis...”.

79. P16 under conclusion, Line 2-3. I suggest: “... to maintain its evidence base through the research results of the authors and the other conservative experts working on relevant topics.” (Restriction to SOSORT members is overly restrictive here.

80. P16 under conclusion line 4. I suggest: “... so as to reduce time spent training for patients....”

81. P16 under conclusion Line 9 (Please delete the anecdotal information in the parenthesis. Ti does not belong in conclusion. It may be relevant where you discuss the adaptation of the visit schedule earlier for some patients.

82. In the paper it may be relevant to describe the nature of the training that would make a therapist qualified to offer SEAS therapy. What does this training consist of.

83. For fig 2,4, 6, 8, Please clarify that the pictures are not after self-correction they are while maintaining self-correction. This is in contract to what the posture would look like after a period of training when the self-correction would have become so natural for the patient that the relaxed posture would keep many of the corrected characteristics. (you could consider introducing pictures of patients before the program compared to the after the program.). Please clarify if figure 4 represent immediate correction (within a short time from before or a post therapy radiographs eg. At maturity or after months of therapy?).

84. In my opinion the figure 20 does not really add much benefit for the reader and the flow is adequately explained in the text.

OPTIONAL:

1. P6 Line 4 I suggest: “... The column’s capacity to maintain proper alignment.

2. P6 L6 I suggest: “... highest potential for stabilization (ie maintaining the spine’s proper alignment). The purpose is achieved by asking the patient to perform the actions that challenge the stability of the spine such as balance exercises, exercises using an additional load, exercises that include dynamic components and other challenges related to the deficits detected during the initial exam.

Level of interest: An article of importance in its field

Quality of written English: Needs some language corrections before being published

Statistical review: No, the manuscript does not need to be seen by a statistician.
Declaration of competing interests:

I declare that I have no competing interests