

Transcript of a video conversation with Dr. Lynn McAtamney on the Origin of RULA (conducted on February 22, 2024).

Alan: Hello, everybody. My name is Alan Hedge. I'm a Professor Emeritus of ergonomics at Cornell University, and I want to talk today to doctor Lynn McAtamney, who is the person who developed RULA, the Rapid Upper Limb Assessment system, and also worked and co-developed REBA, the Rapid Entire Body Assessment system. And this is Lynn. I hope you don't mind me calling you Lynn.

I think it's going to be really useful for you to know how this was developed, why this was developed, what the things are that you should be looking out for when you're actually applying this method.

It has become I believe, the most commonly used method for assessing work postures, in any part of the world. So, I'm going to ask Lynn. I first met Lynn when she was at Nottingham University in the UK. I happened to have the luck of being there on sabbatical, and she was working with Professor Nigel Corlett, who was a Chairperson, and they introduced me to the very first version of RULA, which I thought was amazing, and ended up encouraging professor Corlett to come to the States, talk about it even before it was published, which it was in a prestigious journal.

So, this is my opportunity to talk again to Lynn and ask her about RULA. And my first question is, can you set the context for why you thought about developing RULA, and then we'll talk about how it happened.

Lynn: Well, I was doing my PhD at Nottingham, and it was through a need for a postural assessment tool, for which there wasn't one, that I developed RULA, with Nigel Corlett as well. A little bit of background is that I come from Australia when we'd had the RSI (Repetition Strain Injury) 'epidemic' and I was working with Professor David Ferguson, Barbara McPhee, who was an occupational physiotherapist, one of the first in the world. I think Professor Tuulikki Loupajarvi (from Finland) and Barb (McPhee) were some of the original researchers looking at RSI. Now you've got 'occupational injury syndrome', you've got 'CTD', got tenosynovitis, but essentially in the 80s there was an 'epidemic' that the medical and industry managers just did not know what to do with. So, I'd done that research, I was doing that research [with Ferguson and McPhee], I came over to the UK and my [research] topic was to look at the interaction of mental and physical risk factors in the development of upper limb disorders, [such as] RSI, because I was really interested to know when you look at the whole person, which is of course what we do as an ergonomist, what is going on in the physical world but also what's going on in the cognitive mental world.

So, when it came to looking at the postural analysis, I didn't have any tool and that's where RULA started. I remember coming down to Professor Corlett's office and, he would always start our meetings with a cup of tea and, I remember talking to him about this and he was very excited.

He [Professor Corlett] was, an extraordinary man, I do honor him, and so, to have those conversations with him and for me with my physical therapy, (physiotherapy) background and him with his engineering human factors background, we were both excited to start working on this tool. That was only part of my PhD and, just to finish the story, when RULA was developed, so many people were using RULA and for, it was, it was designed for static postures, for seated or standing static postures and are using it for active postures that I thought I need to create another tool and a colleague of mine, Sue Hignett, another physiotherapist, was keen to work on that. We worked on REBA together, Rapid Entire Body Assessment.

Alan: So how did the name RULA arise? Was that something that you developed, the acronym?

Lynn: Yeah. I love to do that because I think, coming out of physiotherapy, you're always wanting to teach people. You're wanting people to own the knowledge because otherwise it's only pain that drives people. If they've got knowledge, then hopefully they'll have something in that early intervention toolkit. And RULA was, it's a word that people would remember, and it was a word that they would relate to and so, yeah, [that is why] I created that [anacronym]. Nigel thought it was great and then, of course, REBA just floated from there.

Alan: Yes. I always thought it was such a great, word because it's like 'ruler' E.R., right? It's amazing. It's an adjective.

Lynn: Yes, exactly. And when you're an Australian in Australian England, they do like to correct you on how you say things. So that used to be amusing, but it's meant to be 'E.R.'. That's the joke of it. Exactly.

Alan: Brilliant. So at that time, I know that the European Union (EU) also had introduced a directive on having people look and evaluate the risks in jobs. And I remember a conversation with Nigel in which he said he thought that RULA would be the ideal tool to be able to screen a group of workers, because as I recall, one of the requirements was the RAPID part of this. There were some other tools around that you'd use that were not very rapid. That's right. Is that correct?

Lynn: Yes. Absolutely. It was rapid, but also need to be robust. And the other thing was you didn't need any technology. You didn't need you pen and paper?

Alan: So Okay. So, having spent many years sort of teaching students about RULA, I have some questions. So the question that comes from students, and that is, in the RULA imagery and in the RULA paper, you have a side view person working.

And question number 1, I was always asked, do you need to look at both sides of the body, left side and right side? So, do you?

Lynn: Okay. So I only had one side of the body because my research only needed one side of the body parts. That's what happened.

And as we started to use it for other things, as long as the body is symmetrical, so in keyboard tasks usually fairly symmetrical but, observer needs to make that decision. So, if the mouse is being held way out of the side for example, then you actually need to assess on both sides.

Alan: And then the question, again, I get from students is if I do that, [with] the keyboard and mouse setup, one side could look fairly neutral, the other side could look somewhat deviated.

And the other question I get is, well, do you divide the scores? Do you just take the whole score, or do you treat the two sides separately and say, well, for, say, if you're doing right handed mousing, when you're using the mouse, this is how you change?

Lynn: So Yeah. You actually, it's a rapid tool, but you get double the amount of information if you've got the left and the right side. Equally you could have 2 hands on the keyboard, but someone's doing a lot of data entry. That's a very rapid task. So you've got a different level of risk on the right hand than you do the left. So therefore, you would do both [left and right sides] and you would look at them separately but then you could combine it together. Let's look at the whole person. What's going on here? How can we change this? How can we reduce that risk to make it somewhere in that 1, 2, 3 range is where we want to get to.

Alan: Good. Now another question I would get, lots of questions from our students, is you have specific angles in here, like, for example, the hand being 0 to 15 degrees, in wrist extension. How accurate do you need to be with those angles?

Would if you were 16 degrees, would that really be much worse than 15 degrees? And how did those angles emerge?

Lynn: So I went to the second first. They sure. They came from research and from the data.

So, part of what I did was to go back and look at the biomechanical literature and to see and where there was studies that had shown the difference in increase in muscle work or loading that was on the joints or the ligaments in those various positions and postures. To answer your first question, we always ere on the side of go to the highest score. So if you're sitting at 15 degrees, you're not quite sure, you go up to the next category because it is a rapid risk assessment. So, we don't want to miss anything and so it's quite simple. Again, to start with, I was, as a physio, I could, I could visualize those angles. But when I started doing the beta testing with a range of engineers who are not skilled to do that, I found that it was fairly robust and if we just did that cautionary 'go up to the next one', they would still get the right scores. It would still work very well. So, you didn't need that specific skill, which is where it started. But having the diagrams there, I think people can just compare quite well and so people are pretty good at doing it. I was really quite impressed with those engineers.

Alan: So talking about the diagrams for a moment. I mean, the diagrams rely on some anatomical landmarks. And in some instances, again, a question my students would ask is that, for example, a person who has very long hair could be covering some of the anatomical landmarks.

A person who's wearing very loose clothing could be covering some anatomical landmarks. To what extent is guesstimating, acceptable in using RULA? I mean, do you have any thoughts on that?

Lynn: It's always ideal if you can. [Lynn gestured moving Alan's] You know? Excuse me...just move your hair. That's not really acceptable.

So, you do need to guesstimate as best as you can. The other thing I would say is important is when you are looking at your posture you must remember possible parallax error because that can influence the scoring. Beyond that, if you're looking at a comparative score, you're actually comparing like with like. So however accurate or inaccurate you were making that decision through the hair, if then you get them to move or change and you take the score again, you're probably not going to have significant error, nothing that is going to make it unsafe or increase risk. So, we just do the best we can.

Alan: So related to that, another question I would get is that, should I do multiple RULA assessments at, say, 3 to 5 minute intervals, so then take an average or look for the worst one, Or should I think a single assessment is sufficient? And do you have any thoughts on that?

Lynn: So this is developing RULA out into task analysis and deciding how you're going to do it and a good ergonomist would stand and watch for quite a while and

go, 'this is such a static task, I just need to take 1' or I only need to take one for that keyboard work but when they actually pick up the phone, I do need to do a separate one. So you're kind of doing a task analysis and then you go back and you score it.

A lot of the times I would work off of a video and as well and then I could make that decision And then from the video, I could go, well that task was 10 minutes and, 30% of that time they were using the phone. So, then you can use those scores and give a percentage at 7 as opposed to a percentage at 4, if you needed to. But really all the time what you're doing is asking which part of this task is likely to be the furthest away from a neutral posture and therefore is likely to be, causing some cumulative fatigue. Understanding that the muscles, especially around the trapezius, the muscles here fatigue really quite quickly and Jonsson, did some beautiful work looking at just how low a maximum, voluntary contraction you needed for fatigue to start carrying those muscles.

So, whilst it's excellent to measure the posture, I always say it's what is going on before and after you did the ruler score that counts, just as much. Since RULA, I think we've come a long way and we now look at activity based work and those sorts of concepts where we understand that the body responds to movement. So there was no 'right' static posture.

Alan: Right.

Lynn: The best posture is your next posture. The next movement that you do.

Alan: If it helps you with a good posture.

Lynn: True. Yeah. So movement....

Alan: Yes, movement is definitely important. But RULA is still widely used. So I have a couple more questions about that. So RULA translates some quite detailed postural assessment into an overall score.

And that score ranges in dyads, 1 or 2, 3 or 4, 5 or 6, and then a 7 or more, if you like. And the question that I would again get asked by students is that, well, if I have somebody who scores a 4, they're just on the cusp of being a 5. Should I err on the side of caution and treat them as a 5? Or, you know, in other words, how much can I say this really is not a risky posture that the person is in, or should I always on the side of there could be some risks when going to intervene? Do you have any thoughts on that on the use of those?

Lynn: That's a good question. So there's 2 things you can do. 1 is and you go back to the scoring. So, for each of those body parts, if the score is, coming up into a 4 or 5, even if you've got an overall score of 4, but you go and you have a look and

you go, 'my gosh, those shoulders are 5 or those 4'. What is going on there? And you go, 'well of course, that's what going to happen because of where the keyboard angle is'.

So you start working back into your problem solving. So that's the first thing to do, is to go and look at where that body part is, that's the highest score, and see if that is something that you can work on and the second is wherever you've got static or repetitive, which is the scores that you add towards the end, you want to go what can I do about that? So even if it's a 4 or should I put it into a 5, I would go back and I would look at those two factors, see what's going on because then you're actually starting to do the problem solve. Yeah. And then if that was going into a report and you were on a borderline, you may put it up to 5 because you know there was some static work on that posture or there was some repetitive work or indeed we have a neck or a shoulder or some part score that's high. I want to look at that. So, I would leave it as a 4 if I was just doing the analysis on 1 person. Note those things, go back and do a re-score and go, 'look at that, you've come back down to a 2'. People love knowing what their scores are.

Alan: This is true.

Lynn: And it's really in a lovely way to educate people. So, if I do this from this [hand gesture reducing the risk score], or if you do this from this [indicating a lower RULA score], it so much easier than trying to tell them to 'do this, do that'.

Alan: So it's always a good idea after you've done the risk analysis to have an intervention, like a training or having a person changing posture where we can change it [the score] and then repeating the RULA analysis.

Lynn: Mmm [nods in agreement]

Alan: Now a question again I would get asked is, well, should I then repeat it a couple of times? Because people might not change in the short term, but change over time, or people might change in the short term, but then revert back to a bad habit over time. So I guess the question is, is there I mean, it's such a relatively 'easy in terms of time' method. Is there any danger in overusing it to look at how people work?

Lynn: Not at all. If you need to re-educate, it's a great tool to re-educate. What was useful, what is very useful, is if you start to put other measures with RULA. So if you look at the posture score and then you look at productivity or error score, and there's a lot of research now that has done this, then you start to get a really strong influence of 'oh, if I improve that posture I'm going to decrease my error rate' and so in manufacturing, for example, that's been well proven time and time again. Then people go, 'oh, there's a double whammy here'. I'm going to re-educate myself. I'm going to think about that [risk] or you've got managers that are going to

be much more amenable to investing in modifications on that line because they can see the benefit both for the individuals but also for productivity.

Alan: That's great. Can I ask one other question here? Okay.

Alan: So you mentioned RULA and you also mentioned REBA, the entire body. Can you give me a little bit of background on what the real difference is because, I see a lot of people potentially misusing RULA for something where they might be using REBA because it doesn't appear in as many research papers as RULA does. So, I think it'd be very useful to know how do people know this is really a REBA task, this is really a RULA task.

Lynn: Okay. So REBA came from the RULA research. RULA has a higher sensitivity for the upper limbs, the neck and the back and, that's really an important area from, an industry point of view. The number of people that have neck and shoulder problems is quite significant cost in the industry. That works best, always RULA works best, where the task is seated or people are standing, so that they're really not walking around. Having said that, you can use RULA if they work in a laboratory, for example, and they're standing at one pipette station and then they go and work on a microscope. You would do [assess] both of those with RULA. You get much more sensitivity.

With REBA, you've got the opportunity of looking at movement of the body but also of what might be happening from a manual handling point of view. So, wherever there's manual handling going on, you would use REBA.

So REBA, we validated a lot with nurses and then RULA, we validated a lot with manufacturing and with screen based tasks. So, they're the 2 major differences.

So REBA is not sensitive for the upper limbs but it's more sensitive for manual handling and for the lower back and the demands that are happening on the lower part of the leg. Does that make sense?

Alan: That makes an awful lot of sense. So it's really excellent.

So, one final question in the interest of time. Do you have any thoughts on the future? Do we need a future method that maybe combines the best of RULA and REBA, or do we need some is there some other advantage?

I mean, I know there'd be another methods out there to essentially are taking sort of a bird's eye view of how somebody is working because it can be sort of hard to judge that from observing sideways on or so forth. Do you have any is there do you see a potential future development?

Lynn: I will give you my little piece of mind. So RULA was for research that was looking at the interaction of mental and physical factors, and as ergonomists, we're passionate about looking at the whole person. And I think whenever we use these tools, we need to remember that and step back and look at what's going on. So, what is the [task], what is the management? What's the autonomy? What's the job satisfaction?

Where is the cognitive loading going on? Where is the stress as that word is used a lot these days? Those components are huge in the development of people's self-reporting of symptoms or in taking sick leave. So there's an impact on productivity. With the research I was looking, as well as the posture, I was looking at, the cognitive level, so how interesting the task was. So let's say boring and interesting and I was also looking at the pacing. So one was self-paced and the other was externally paced. Now there isn't as much externally paced work now as there was back in the RSI 'epidemic'. I mean the RSI epidemic, the one measure of success was how fast you could key, key the numbers or do your keyboard rate. So we've come away from that a lot but still in manufacturing, that that is important is that external control.

So those are the 2 components that I looked at. How interesting it was and how much control the person had over the work. Those 2 components when they were combined together, had more influence than whether they were sitting in a poor posture or not, as to whether they were going to report symptomatology that was equal to development of musculoskeletal disorder. If you put all 3 together, so it was a paced task which was a low cognitive task, it was just a data input task and you're in a poor posture, clearly that was the worst. That's, that's just really, really bad management and bad design.

But, I think we always need to remember how is that person interacting with that task, and how's that person coming away from that task at the end of the day?

Do they feel satisfied? Do they feel worthwhile? Have they had a good social, environment and have they felt heard? Do they feel that they're part of the decision making or not? Those are the elements we also need to look at when we look at using the RULA or REBA.

Alan: Amazing. Okay. I have to say a great thank you to Lynn. In 30 years, you have changed the field of ergonomics. Your methods are, I think, the most widely used methods I know of and the most respected methods that I know of. And it's been a great pleasure talking to you. Thank you so very much

Lynn: Well, thank you very much. And I would like to acknowledge Professor Nigel Corlett and Sue Hignett as well.

Alan: Absolutely

Lynn: And we acknowledge those Ergonomists who came before us and were passionate for this industry, and I hope that this gives some passion to our young Ergonomists to want to make a difference to other's lives.

Alan: And I hope that does, and, and to the ergonomists that come after us as well. I hope that they, read the papers, that they think carefully about how they use the methods, so they don't abuse the methods, and that they realize the power that they have in these methods to truly improve the working life for many, many people.

So thank you very, very much for your time.

Lynn: You're very welcome. Thank you.

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