Acceptability of an embodied conversational agent for type 2 diabetes self-management support via a smartphone app: a mixed methods study.

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Background and aims
- Embodied conversational agents (ECAs) are increasingly used in various healthcare applications (apps)1), however their acceptability in type 2 diabetes (T2D) self-management apps has not yet been investigated.
- We evaluated the acceptability of an ECA, ‘Laura’ (Figure 1) for delivering self-management support in the ‘My Diabetes Coach (MDC)’ smartphone app.

Methods
- Adults with T2D were recruited into a randomised controlled trial(2,3) of the MDC program. Intervention participants allocated to use the MDC app completed 1) a 6-month post-baseline survey assessing attitudes to and interactions with Laura and 2) in-depth qualitative interviews exploring users’ experiences of Laura.
- Using an explanatory mixed methods approach, we analysed survey responses with descriptive statistics and integrated these findings with a thematic analysis of the interview data.

Results
- Of the 93 MDC intervention arm participants, 66 (71%) completed follow-up surveys. Thirty three (50%) were women, aged 57±9 years, with a HbA1c of 7.1±1.4%.
- Descriptions of Laura were mostly positive (Figure 2), with participants agreeing that she was competent (85%), trustworthy (73%), helpful (86%) or likable (61%). Fewer participants described her as being boring (39%) or annoying (30%).
- Most respondents reported positive interactions with Laura (Figure 3), feeling motivated (44%), comfortable (36%) and confident (21%). Fewer reported frustration (20%), worry (10%) or guilt (7%).
- Interview participants (N=19) included 8 (42%) women, aged 60±8 years, with a HbA1c of 6.8±4.9%.
- Four themes emerged regarding Laura’s acceptability (Table 1): 1) Laura’s perceived role as a “friendly coach”; 2) Laura’s value add was providing motivational and emotional support; 3) Laura’s “human-like” nature was preferred to a non-human character; and 4) Dissonance in Laura’s speech and body language reduced her acceptability.

Table 1: Interview themes and illustrative quotes

<table>
<thead>
<tr>
<th>Themes and subthemes</th>
<th>Quantitative data: Survey adjectives</th>
<th>Qualitative data: exemplar quote</th>
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<tbody>
<tr>
<td>Laura’s perceived role:</td>
<td>Laura was likable (60%), friendly (85%), helpful (85%).</td>
<td>“neutral approach” because it “didn’t try and lean on any perceptions of authority.” (4/4/4 years)</td>
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<td>Laura was not as acceptable as an authoritative role.</td>
<td>Interacting with Laura made me feel comfortable (36%).</td>
<td>I was worried about making sure that I was within [my limits] knowing that I had to report to Laura” (4/4/4 years)</td>
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<td>Laura’s perceived support:</td>
<td>Laura was trustworthy (72%).</td>
<td>“I needed somebody just to be there.” (5/5/5 years)</td>
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<td>Laura was not as acceptable as a helpful role.</td>
<td>Interacting with Laura made me feel confident (21%), helpful (32%) and happy (46%).</td>
<td>“She used to make me laugh... and that’s hard to do!” (5/5/5 years)</td>
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<td>Laura provided emotional support.</td>
<td>Laura was competent (84%).</td>
<td>“It’s not just about going to the drug, running your tests at home, taking notes, that’s just the nuts and bolts.” (5/5/5 years)</td>
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<td>Laura was more engaging than an app without an ECA.</td>
<td>Laura was helpful (85%).</td>
<td>“I’m not sure I would have given the same level of credibility to, for example, a dog or a cat or something like that.” (4/4/4 years)</td>
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<td>Character preference:</td>
<td>Laura was competent (84%) and trustworthy (72%).</td>
<td>“I didn’t know who would be the most helpful to me.” (4/4/4 years)</td>
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<td>A human-like character was more appropriate than a non-human character.</td>
<td>Laura made me feel confident (21%) and comfortable (36%).</td>
<td>“It’s about being able to relate to your doctor” (4/4/4 years)</td>
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<td>Room for improvement:</td>
<td>Laura was annoying (30%), boring (40%) and (not) real (28%).</td>
<td>“She said something, but her hand gestures were exactly the opposite of what they should have been. Like, rather than a big gesture, where a big gesture is needed, there was a little gesture.” (8/8/4 years)</td>
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Conclusions
Overall, these findings suggest that an ECA is an acceptable means to deliver T2D self-management support via a smartphone app. Improving acceptability will require a better understanding of the role that users expect an ECA to play in self-management and perfectly the ECAs’ natural communication.

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References

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Figure 1: Embodied Conversational Agent: Laura
- Use of the MDC app involved weekly 15-30 min sessions with Laura at a set time chosen by the user.
- Topics: blood glucose monitoring, nutrition, physical activity, medication taking and foot care.
- User can have a ‘conversation’ with Laura using interactive voice recognition and pre-scripted conversational elements.
- Highly personalised user experience - clinical targets and BG monitoring frequency recommendations provided by the user’s HCP and user responses dictate the direction of the next session.
- Laura provides tailored education, personalised goal setting and feedback.
- Introduction module excerpt: https://www.youtube.com/watch?v=8nfw8Cpd8yA