

Personalizing Motivation: Combining Motivation Theories and Persuasive Technology for Children’s Language Development

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1 Introduction

Acquiring language at an early age is heavily impacted by multiple factors, one of which is exposure to language [10, 6]. This study aims to devise a motivational system to boost parent-child interactions, focusing on personalizing motivation and providing richer suggestions supported by evidence.

Persuasive technology (PT) often gives suggestions or advice, but can be limited to generic information (e.g. [21]). PT traditionally takes a ‘one size fits all’ approach (as opposed to tailoring motivation to individual users) and is often created when the designer knows the points of persuasion or motivation in advance, with the intention to motivate toward a general behaviour by providing the same information (e.g. feedback or goals) to individuals who are all motivated differently; that is, they have different values, perspectives and history with the behaviour. In domains such as parenting, a person’s lifestyle, background and beliefs can inform to what extent and in which ways they perform language boosting [22, 12], suggesting it is important to personalize approaches to motivation/advice giving to the individual.

Steps are being taken in the right direction; for example, [9] tailors feedback based on user actions. [1] utilizes a motivational agent which outputs phrases and games based on personality, based on the Big Five Inventory [20]. [7] incorporates argumentation theory to steer persuasion in health behaviour change. [4] recognizes the power of coupling personalization and persuasion by incorporating user modelling, and taking into account user interests and preferences, while [8] suggests that we should consider user attitude and interests. [14, 13] provided personalized persuasion at the level of influence strategies. [11] utilizes the transtheoretical model [19] to understand the user and tailor the motivational strategy according to the users current stage of change. [5] suggests that understanding these behaviour change theories is critical to changing behaviour.

2 Research Questions & Plan

The research is being undertaken in the context of the Language 0-5 Project [17], a project run by the International Centre for Language and Communicative De-

velopment (LuCiD) [16] to support the Babytalk mobile application [18], which is a digital intervention software focusing on boosting language acquisition.

The primary research question is therefore *“How can we improve on one-size-fits-all approaches by incorporating motivation on an individual user basis in the context of children’s language development?”*. Babytalk will consist of two layers - (1) an ‘intelligent’ layer, providing motivational ability and reasoned suggestions and (2) a motivational interface representation of (1).

Various sub-questions have been identified. The first (Q1) *“How can we model and reason about aspects of a parent’s motivation in the context of value-based argumentation frameworks (VAF)?”* and second (Q2) *“How can we model motivational interactions between an expert and a parent in the context of a motivational dialogue?”* form the ‘intelligent’ aspect of the system. The system will reason about suggestions with respect to motivation using VAF’s [3]. This process will supplement a motivational dialogue (existing dialogues are categorized in [23]) by providing suggestions based on motivation-oriented values, dialogue history and psychological evidence for each suggestion. A basic initial user model will be captured via questionnaire (including a readiness level based the trans-theoretical model). This phase will first involve defining a theoretical dialogue representation, and then (Q1) and (Q2) will be combined and evaluated by constructing a dialogue game (e.g. [2]).

The third and fourth sub-questions (Q3) *“How can we design a user interface which accurately portrays the dialogue moves performed by the expert in (Q2) and collects meaningful dialogue replies with respect to motivation?”* and (Q4) *“How can we design a user interface which sufficiently engages parents?”* form the motivational interface aspect of the project. (Q3) will require research into the HCI side of PT in order to find relevant motivational concepts to incorporate into the interface. One idea may be to find ways to incorporate existing lifestyle metaphors in the interface as is used in [15]. Evaluation of (Q3) and (Q4) is likely to take a qualitative approach involving parents in order to assess the accuracy of the dialogue portrayal and its level of engagement.

The fifth sub-question (Q5) *“What are the most important determinants of parent-child interactions? Is there any relation between a parent’s background factors and the factors which encompass their motivation?”* These data are likely to be useful for future parent-based interventions. Measurement of this will depend on how (Q1) and (Q2) are structured, e.g. how background factors are mapped to the reasoning or how a ‘move’ in the dialogue is interpreted.

The project is still in its early stages; to date, a literature review has been conducted on motivational technology, theories of motivation and behaviour change and argumentation theory, and work has begun on the theoretical representations of (Q1) and (Q2) by defining what it takes for an argumentation dialogue to be motivational. Reasoner values for (Q1) will next be defined in collaboration with LuCiD researchers. These values will be the basis on which suggestions to parents are formed. Suggestions will also be established and verified within LuCiD in the current phase to ensure that each suggestion has a sufficient base of evidence.

References

1. Arteaga, S.M., Kudeki, M., Woodworth, A.: Combating obesity trends in teenagers through persuasive mobile technology. *ACM SIGACCESS Accessibility and Computing* 94, 17–25 (2009)
2. Atkinson, K., Bench-Capon, T., McBurney, P.: A dialogue game protocol for multi-agent argument over proposals for action. *Autonomous Agents and Multi-Agent Systems* 11(2), 153–171 (2005)
3. Bench-Capon, T.: Value based argumentation frameworks. *arXiv preprint cs/0207059* (2002)
4. Berkovsky, S., Freyne, J., Oinas-Kukkonen, H.: Influencing individually: fusing personalization and persuasion. *ACM Transactions on Interactive Intelligent Systems (TiiS)* 2(2), 9 (2012)
5. Chatterjee, S., Price, A.: Healthy living with persuasive technologies: framework, issues, and challenges. *Journal of the American Medical Informatics Association* 16(2), 171–178 (2009)
6. Curtiss, S.: *Genie: a psycholinguistic study of a modern-day” wild child”*. Academic Press New York (1977)
7. Di Tullio, E., Grasso, F.: A model for a motivational system grounded on value based abstract argumentation frameworks. In: *Electronic Healthcare*, pp. 43–50. Springer (2012)
8. Filonik, D., Medland, R., Foth, M., Rittenbruch, M.: A customisable dashboard display for environmental performance visualisations. In: *Persuasive Technology*, pp. 51–62. Springer (2013)
9. Gamberini, L., Spagnoli, A., Corradi, N., Jacucci, G., Tusa, G., Mikkola, T., Zamboni, L., Hoggan, E.: Tailoring feedback to users actions in a persuasive game for household electricity conservation. In: *Persuasive Technology. Design for Health and Safety*, pp. 100–111. Springer (2012)
10. Hart, B., Risley, T.R.: *Meaningful differences in the everyday experience of young American children*. Paul H Brookes Publishing (1995)
11. He, H.A., Greenberg, S., Huang, E.M.: One size does not fit all: applying the transtheoretical model to energy feedback technology design. In: *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*. pp. 927–936. ACM (2010)
12. Huttenlocher, J., Waterfall, H., Vasilyeva, M., Vevea, J., Hedges, L.V.: Sources of variability in childrens language growth. *Cognitive psychology* 61(4), 343–365 (2010)
13. Kaptein, M., De Ruyter, B., Markopoulos, P., Aarts, E.: Adaptive persuasive systems: a study of tailored persuasive text messages to reduce snacking. *ACM Transactions on Interactive Intelligent Systems (TiiS)* 2(2), 10 (2012)
14. Kaptein, M., Duplinsky, S., Markopoulos, P.: Means based adaptive persuasive systems. In: *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*. pp. 335–344. ACM (2011)
15. Kientz, J.A., Arriaga, R.I., Abowd, G.D.: Baby steps: evaluation of a system to support record-keeping for parents of young children. In: *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*. pp. 1713–1722. ACM (2009)
16. *LuCiD: International centre for language and communicative development*. <http://news.liv.ac.uk/2014/03/24/9m-to-understand-how-children-learn-to-talk> (2014 (accessed January 6, 2015))

17. LuCiD: Language 0-5 project. <http://www.language05.co.uk> (2014 (accessed January 6, 2015))
18. LuCiD: Babytalk. <http://www.lucid.ac.uk/what-we-do/technology/babytalk-app> (2015 (accessed April 17, 2015))
19. Prochaska, J.O., Velicer, W.F.: The transtheoretical model of health behavior change. *American journal of health promotion* 12(1), 38–48 (1997)
20. Rammstedt, B., John, O.P.: Measuring personality in one minute or less: A 10-item short version of the big five inventory in english and german. *Journal of research in Personality* 41(1), 203–212 (2007)
21. Revelle, G., Reardon, E., Green, M.M., Betancourt, J., Kotler, J.: The use of mobile phones to support childrens literacy learning. In: *Persuasive Technology*, pp. 253–258. Springer (2007)
22. Rowe, M.L.: Child-directed speech: relation to socioeconomic status, knowledge of child development and child vocabulary skill. *Journal of child language* 35(01), 185–205 (2008)
23. Walton, D.: *Commitment in dialogue: Basic concepts of interpersonal reasoning*. SUNY press (1995)