In Situ Observations of Non-verbal Emotional Behaviours for Multimodal Avatar Design in e-Commerce

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Paper presented at MIDI 2013 Conference, 24-25.06.2013, Warsaw, Poland.

Abstract
This paper reports an empirical study on non-verbal emotional behaviours - facial expressions and body gestures - with the ultimate goal of informing the design of multimodal avatars with authentic emotional expressions for e-commerce websites. In the study 12 salespersons were observed when they were interacting with 29 customers in two furniture retail shops. To facilitate the observational process, we developed a template called NEBOT with a set of common facial expressions and body gestures in human-human communications. Results indicate that neutral facial expressions were more frequently used than expected. Implications for improving the template as a research tool in other contexts and for designing avatars for e-commerce websites are inferred.

Author Keywords
Non-verbal cues; Emotional behaviour; Facial expression; Body gesture; Multimodal avatar; Design; e-Commerce; Contextualization

ACM Classification Keywords
H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

Introduction
Research studies in the last few decades indicate that non-verbal cues – facial expressions and body gestures - can facilitate exchanges of information between communicative partners [1, 2, 3, 4]. Specifically, body gestures are wide ranging in terms of their ability to communicate and work effectively together with verbal communication for more expressive human-to-human interaction [5, 6, 7]. Likewise, facial expressions can reveal humans' emotional state, involvement and

responsiveness during their conversations, and can reflect their associated thoughts and feelings [8, 9].

A number of researchers have investigated the verbal and non-verbal aspects of natural human communication (multimodal interaction) and attempted to produce virtual human-like agents (avatars) as one's self-representation (e.g., [10]) or embodied conversational agent (e.g., [9]) in user interfaces for different contexts of use, especially information presentation. As compared with interfaces having only textual information and static images, multimodal interfaces can enable users to perform tasks successfully with a higher level of efficiency, enjoyment as well as satisfaction [5, 6, 9, 10, 11].

Integrating non-verbal cues into a virtual character to express one of any six basic emotions classified by Ekman and Friesen [12] was a common key goal of several ergonomic studies (e.g., [9, 13]). It was found that enriching an avatar with non-verbal cues could induce more natural interaction between the agent and end users. However, designing a multimodal avatar remains a challenging task; these agents may be highly expressive, but may not fit users' needs or abilities [10, 11]. The selection of non-verbal cues and body gestures to be used for e-commerce avatars has primarily been based on the literature review [3] and on the outcomes of multimodal avatar acceptance tests, which are lab-based with non-representative participants such as a convenience sample of university students (e.g. [14]). As the selection process is not grounded in knowledge how non-verbal cues are actually used in real-life contexts, there is a serious concern that such cues may not fit the task where they are deployed. This issue has motivated us to conduct in situ observations to understand which non-verbal cues are normally used by salespersons.

Observing human behaviour in a specific environment seems to be an intuitive task, given that behaviour, whether verbal or nonverbal, is always overt and therefore highly observable [15]. However, documenting and analysing such behavioural data systematically and drawing implications from such data to the design of an interactive system are much more challenging. It is especially relevant when data collection has to be conducted under high time pressure and other situational constrains such as highly dynamic interactions involving multiple parties and impracticality of video recording. Such contextual constraints for data capture are not uncommon, especially in privacy-sensitive settings such as hospitals or where a corporate brand may be at stake. To address this issue, we have developed a tool called Emotional Behaviour Observation Template (NEBOT). In brevity, NEBOT comprises a set of most commonly used positive, negative as well as neutral facial expressions and body gestures. It has been applied in our explorative research: conducting in situ observations of non-verbal cues of salespersons when they interact with customers in furniture retail stores in order to inform the design of expressive avatars for a B2C e-commerce website for such stores.

Related Work

The use of online avatars has motivated several studies in different disciplines to investigate their potential to enhance user's involvement in interacting with respective systems [10, 11, 14, 15, 16]. As mentioned earlier, information presentation through an animated avatar with appropriate emotional expression in the

user interface may influence both user engagement and motivation [2, 10], because non-verbal communication enables us to express information effectively to other parties in the interaction [10, 17, 18].

Fabri and colleagues [3] investigated the utilisation of facial expression as a channel for conveying emotion in user interfaces. Their study examined the six universal facial expressions [12]: surprise, anger, fear, happiness, disgust and sadness. The main purpose of their study was to investigate whether users were able to interpret accurately the six emotions associated with facial expressions of an avatar. Later on, Fabri and colleagues [1] conducted another study to examine a virtual messenger that had been developed to give any two users the chance to meet virtually. Moreover, this virtual messenger was enriched by six expressive human-like faces to give users different choices in presenting their emotions during the communication. The results of this investigation indicate that the use of expressive human-like faces in virtual messenger has significantly improved user's involvement and enjoyment [1].

Kuligowska and Lasek [9] conducted a study that integrated an expressive virtual assistance on e-business website with the conversational ability to support customer relations and business processes. The results of this study indicate the advantages of using an expressive avatar; it saves customers' time by providing a quicker information exchange, providing a website with a more natural touch, and it can affect customer's loyalty, as customers seem to visit the website fairly regularly [9]. Furthermore, avatars can serve as a motivational tool that can significantly enhance learning outcomes in various contexts (e.g., [10, 19]). To serve this purpose, Baylor [10] argued that avatars should be designed to look as human as possible and that the agent's presence and non-verbal cues should fit the message delivered.

Theonas and colleagues [20] observed three lecturers' and students' behaviours in a series of lectures in order to investigate the effect of the lecturer's facial expressions on the students' motivation during the lecture. They reported using 'an observation table' ([20] p. 33) to record both lecturers' facial expressions and students' reactions. However, it is not explicitly mentioned whether the table comprised only textual descriptors or visual images of facial expression or both types of representation. We argue that using plain descriptions such as 'tight lips' and 'eyes closed' cannot help understand the meaning of each facial expression. In addition, the interpretation of some of those descriptors is highly context-dependent. Another issue is that translating an observed non-overt emotional behaviour into verbal descriptors may slow down the recording process; this cognitive-perceptual phenomenon has been researched in cognitive science [21]. Hence, we argue that an observation template with expressive avatars identified by emotive descriptors can enhance the efficiency of data capture.

While the development of our observation template, NEBOT, was based on [14] and [24], we aimed to improve on the validity of these previous studies, which were lab based with biased samples of participants (i.e. university students). Besides, they evaluated users' preferences for the selected set of facial expressions and body gestures without contextualizing them in some well-defined use scenarios. In other words, the empirical results did not well represent everyday

interaction in human communication. The lack of realism or naturalism in expressive avatars may undermine their acceptance, which was what [14] and [24] paradoxically aimed to evaluate. Furthermore, representing different emotive responses with visual images has been in the recent user experience (UX) research. However, Self-Assessment Manikin (SAM) [22] and PrEmo [23], for instance, use cartoon (non-human-like) figures and are primarily for evaluation rather than design purpose. Another issue - gender-specific non-verbal emotional behaviour - is not examined in the studies reviewed. The effect of the gender of virtual characters in user preference has been corroborated by research on computer games (e.g. [25])

In summary, the overall aim of our work presented in this paper is to improve on the previous related studies, which were primarily lab-based, by contextualizing the selection of facial expressions and body gestures with in situ observations in the field. Non-verbal behaviours so selected can better reflect natural human-to-human communication, thereby enhancing the acceptance of expressive avatars in which such cues are incorporated.

In Situ Observations Study

Goal and Research Question. The study aimed to identify patterns of non-verbal cues that reflect interactions between salespersons and customers in real-life retail stores, thereby enabling us to design user interfaces of e-commerce websites that support naturalistic interaction. It also aimed to examine the research question on gender-specific cues: *Are there any significant differences in using particular non-verbal cues between female and male salespersons when interacting with customers*? The research method we deployed is in situ observation with which highly contextualized data can be obtained [26].

Instrument. The study is grounded in a literature review on facial expressions and body gestures [1, 12, 14, 17, 18, 20]. Based on the review we have created an observation template called *Non-verbal Emotional Behavior Observation Template* (NEBOT), which consists of 12 most common positive, neutral, and negative facial expressions (i.e. the graphical images in Table 1) and 11 body gestures (i.e. the descriptions in Table 4) that salespersons are likely to use during their interactions with different customers. Specifically, the positive, neutral and negative facial expressions (Table 1) used in NEBOT were extended based on the six common emotions as defined by Ekman and Friesen [12]. Moreover, the body gestures were based on a study made by Gazepidis and Rigas [14]. These non-verbal cues are assumed to be commonly used in everyday communications [13, 27]. The inclusion of negative and neutral expressions is deemed necessary to reflect natural emotion responses in human-human interaction; excessive or non-discriminative use of positive expressions can be seen as overdoing, even in the context of salesperson–customers interaction. However, it is not known to what the extent these cues are actually used by salespersons in context – the empirical question that we aimed to answer in our study.

As mentioned earlier, several research studies on designing avatars indicate that facial expressions are the main channel for conveying emotions and that body gestures can reduce any ambiguity by focusing the communicative partners' attention during natural dialogs [4, 10, 19, 27]. In [14], visual images of facial

expressions were labeled with emotive descriptors (e.g. 'amazed', 'bored') whereas those of body gestures were labelled with factual descriptors (e.g. 'open palms', 'arms folded'). It is understandable because body gestures involve multiple body parts; deriving emotion from their concerted movements is much more difficult than from facial expressions, which are more direct means of conveying emotions. Furthermore, a single image may not symbolize multiple physical movements, for instance, one can clench hands while walking.

Positive			
	Happy/ Smile	Happy/ Joyful	Surprised
Negative			
	Sadness / Sad	Sadness/ Upset	Sadness/ Bored
			
	Fear	Anger	Disgust
Neutral			
	Neutral	Interested	Restful

Table 1. The most probable facial expressions used by salespersons in real-life interactions with customers

The inherent difficulty of associating emotion with body gestures justifies the design of NEBOT. Presented in an A3-size paper, the upper and main part of NEBOT has a set of images representing a range of 12 emotions associated with individual facial expression (Table 1) to ease matching what is observed to what is recorded. The lower half of the template has another set of factual descriptors referring to 11 major body gestures (Table 4). Our contextualized observations aimed to develop a better understanding about the use of facial expressions in context.

Apart from capturing salespersons' non-verbal emotional behaviours, NEBOT can be used to record customers' reactions. However, practically it proved challenging to have a single observer recorded simultaneously non-verbal behaviours of both communicative partners; the accuracy of one would be at the expense of the other. Hence, it was decided to focus on a salesperson's cues while estimating a customer's reaction (i.e. satisfied or unsatisfied). Technically, the facial expressions listed in Table 1 have been developed by using the professional libraries and built-in features of DAZ Studio 4 software, which supports the design of facial expressions and lips synchronization.

Procedure and Participants

To implement in situ observations, the first author made two visits to two furniture retail stores belonging to a global enterprise in the UK in February and March 2012. The main purpose of these visits was to study salespersons' behaviours when they interact with customers, thereby enabling us to identify the common positive, negative and neutral facial expressions of the salespersons and customers' reactions to each type of facial expression. As we were required to conduct the observations without influencing the customers'

shopping experience or disrupting the normal practice of the salespersons, the researcher had to maintain a reasonable distance from the salespersons and customers, making his presence inconspicuous while being able to observe the natural interactions between the salespersons and customers. Furthermore, following the corporate policy to protect the privacy of the company's employees and that of customers, videotaping the interactions was not allowed. As such a situational constraint is not uncommon, an observation template can facilitate data capturing. This is the main rationale for the development of NEBOT.

Salesperson		Customer		Salesperson		Customer	
ID*	G.#	ID	G.	ID	G.	ID	G.
SP1	M	C1	M	SP7	F	C15	F
		C5	F			C19	F
		C6	M	SP8	F	C16	M
SP2	F	C3	M			C17	F
		C4	M			C18	F
		C12	F	SP9	F	C20	M
SP3	M	C2	F			C21	M
		C10	M	SP10	M	C22	F
SP4	F	C8	F			C23	F
		C9	F			C24	M
SP5	M	C7	F	SP11	M	C25	F
		C11	F			C28	M
SP6	F	C13	M	SP12	F	C26	F
		C14	F			C27	M
						C29	F

*ID=identity, G.=gender

Table 2. Overview of salesperson-customer pairs

The first author undertook 29 observations: 12 male and 17 female customers interacting with 12 salespersons (5 male and 7 female) on one-to-one basis in different sections of the retail store, including living rooms, offices and kitchens. Each salesperson was observed 2 or 3 times when he/she interacted with different customers (Table 2). He tallied the occurrence of individual facial expressions and body gestures used by the salesperson. The average time over all the observations was 12 minutes. However, practically this proved very challenging, given the highly dynamic nature of the interaction between the salesperson and customer. Besides, the first author conducted a short post-observation interview with 8 of the salespersons. Unfortunately, not all the salespersons observed were available for interview.

Results

Quantitative Data

All the data collected in both visits were combined together, since the same procedures, settings and instrument were used during the observations in both retail stores. Furthermore, all sections in both stores were organised in a standard way, and salespersons are normally relocated in each of the two stores every two weeks. Given these conditions, it is justifiable to collapse the data collected from both sites into one set. Nonetheless, as shown in Table 2, the distribution of same- and opposite-gender salesperson-customer pairs was uneven. As the observations took place in the real-life stores within some given timeslots, no control of salesperson-customer gender-pairing was possible. Eventually, some salespersons dealt with three customers and some with two, and some had only the opportunities to interact with customers of same gender (e.g. SP4, SP7). Given this limitation, no factorial analysis can be applied to the data. In addition, inter-rater reliability cannot be computed as only one observer was allowed to be present at one time.

Patterns of non-verbal cues. Based on the data of in situ observations, the salespersons were found to use positive facial expressions (249 times), neutral facial expressions (148 times), and negative facial expressions (41 times) during their interactions with 29 customers. Table 3 and Table 4 present the total frequencies of each facial expression and body gesture used by both the female and male salespersons. Obviously, the salespersons used positive and neutral facial expressions more than negative ones. Both female and male salespersons tended to express a happy face together with a waving hand or hand steeple gesture, when they started talking or said goodbye to the customers. Moreover, they tended to use "interested" and neutral facial expressions together with the use of right, left or both hand palms while presenting the product's functionalities to the customers. Other interesting communicative behaviours used by the salespersons were pointing to the product and walking to where it was when any customer approached them and asked about that particular product. Table 4 presents the frequencies of each body gesture used by both the female and male salespersons during their interaction with their customers. Overall, they have used positive body gestures (366 times), neutral body gestures (58 times) and negative body gestures (56 times) during the interaction with the same 29 customers. As shown in the Total Frequency column of Table 4, both female and male salespersons used positive body gestures more than neutral and negative ones during the interaction with customers. It was notable that salespersons used their hands and index-finger when explaining the products' functionalities to customers.

Research question on gender-specific cues. Table 3 presents the mean frequency of male and female salespersons for each facial expression. For positive facial expressions, when interacting with customers, irrespective of gender, male salespersons tended to use "positively surprised", and "joyful" facial expressions more than female salespersons did. Another gender-related difference was that female salespersons tended to use "interested" facial expressions more than male salespersons did. Since all the data collected are not normally distributed, the non-parametric Mann-Whitney U test was used to examine if there were any significant differences between male and female salespersons in using different positive facial expressions, but no significant difference was found (e.g. 'happy' facial expression ($U= 96.5$, $p>0.05$): female salespersons (mean rank = 14.68) and male salesperson (mean rank = 15.46)). In addition, salespersons of both genders used neutral facial expressions, but there was no significant difference between them (e.g. 'neutral' facial expression ($U= 101$, $p>0.05$): female salespersons (mean rank = 14.94) and male salesperson (mean rank = 15.08)).

Interestingly, negative facial expressions were occasionally used by both male and female salespersons, but again no significant difference was found (e.g. 'sad' facial expression ($U= 96$, $p>0.05$): female salespersons (mean rank = 14.65) and male salesperson (mean rank = 15.50). Moreover, Mann-Whitney U test was also used to examine whether there were significant differences between male and female salespersons in using different body gestures, but no significant differences were found (e.g. 'open palms' ($U= 94$, $p>0.05$): female salespersons (mean rank = 15.47) and male salesperson (mean rank = 14.33)).

Note that the salespersons have received formal training on how to approach and communicate with customers, and how to explain product functionalities for customers. Hence, some 'standard' ways of using certain non-verbal emotional behaviours in certain situations are somewhat predictable.

Qualitative Data

The first author conducted 8 short semi-structured interviews with individual salespersons (5 female, 3 male), who on average had salesmanship experience of 5.3 years, in order to triangulate the quantitative data. The main question was about their strategy of using particular facial expressions and body gestures. The interviews were analysed using thematic analysis [28]. Customer satisfaction (in terms of their verbal and non-verbal reactions, and their decision to purchase) and customer age were identified as significant factors that directly or indirectly influencing their choice of specific non-verbal behaviours. These empirical findings can inform the design of multimodal expressive avatars in our fut*ure research work.*

Facial expression		**F**	**Male (n_m=12)**	**Female (n_f=17)**
Positive	Happy/ Smile	173	M = 5.58, SD = 2.19	M= 6.24, SD = 2.16
	Happy/ Joyful	53	M = 2.67, SD = 2.23	M = 1.24, SD = 1.69
	Surprise	23	M = 1.17, SD = 1.99	M = 0.53, SD = 1.60
Neutral	Neutral	88	M = 3.00, SD = 2.09	M = 3.06, SD = 2.46
	Restful	24	M = 1.00, SD = 1.13	M = 0.71, SD = 1.26
	Interested	36	M = 1.92, SD= 1.62	M = 1.12, SD= 2.06
Negative	Sadness/ Sad	15	M = 1.08, SD = 3.45	M = 0.12, SD = 0.33
	Sadness/ Upset	3	M = 0.25, SD = 0.86	M = 0.00, SD = 0.00
	Sadness/ Bored	12	M = 0.33, SD= 0.65	M = 0.47, SD = 1.07
	Fear	7	M = 0.50, SD = 1.73	M = 0.06, SD= 0.24
	Anger/ Angry	1	M = 0.17, SD = 0.57	M = 0.00, SD = 0.00
	Disgust	3	M = 0.00, SD = 0.00	M = 0.18, SD = 0.39

Table 3. Total Frequency (F) of different facial expressions used by salespersons over all customers during the observational sessions

Facial Expression	Body Gesture	F	Male (n_m=12)	Female (n_f=17)
Positive	Left Hand Palms	56	M = 1.75, SD = 3.39	M = 2.06, SD = 2.36
	Right Hand Palms	90	M = 2.42, SD = 1.31	M = 3.59, SD = 2.55
	Open Palms	95	M = 3.17, SD = 2.03	M = 3.35, SD = 1.70
	Hands Steeping	36	M = 1.25, SD = 1.86	M = 1.24, SD = 2.25
	Index Finger	69	M = 2.67, SD = 1.56	M = 2.18, SD = 2.16
	Head Nod	20	M = 0.75, SD = 0.96	M = 0.65, SD = 0.93
Negative	Arms Folded	26	M = 0.91, SD = 2.09	M = 0.95, SD = 2.24
	Face Scratching	13	M = 0.42, SD = 0.99	M = 0.47, SD = 0.94
	Crossed Legs	17	M = 0.33, SD = 0.78	M = 0.76, SD = 1.22
Neutral	Walking	46	M = 2.00, SD = 1.75	M = 1.29, SD = 1.53
	Hand Writing	12	M = 0.58, SD = 0.99	M = 0.30, SD = 0.78

Table 4. Total Frequency (F) of different body gestures used by salespersons over all customers during the observational sessions.

Discussion

Some results of our study are corroborated by the empirical findings of the previous work ([14], [20], [22]). Specifically, the twelve salespersons observed tended to use the positive and neutral facial expressions more than the negative ones. A similar pattern was noted in [20], though the target group was university lecturer and the number of lecturer observed was much smaller with only three. Prior to the study, we queried whether the empirical findings of [20] could be generalized across the application contexts: academic versus commercial, considering the relationships between communicative partners are different in both settings, more hierarchical (lecturer vs. students) at a university setting and more open at a shopping venue. For sustaining the attention and motivation of communicative partners, different strategies could be employed in the two settings, but the empirical findings indicate otherwise. Furthermore, in [20] the relation is one: many (i.e. 1 lecturer to many students) whereas in our study it was one: one (i.e. 1 salesperson: 1 customer). Grounded in real-life experiences, students normally do not expect that a virtual lecturer talks to them on a one-to-one basis whereas e-commerce customers do expect a virtual salesperson talks to them on such a personal level. Consequently, the former's expectation and acceptance criteria for the quality of a lecturer-avatar can be different from the latter's with respect to the quality of a salesperson-avatar. In addition, [14] reported that users had much stronger preferences for the positive and neutral facial expressions than for the negative ones. Our results (Table 3 and Table 4) indicated that Happy/Smile and Open Palms were the most frequently used non-verbal cues of the salespersons; this finding was consistent with that of [14]. The above comparisons between the previous studies and our current one suggest the universality of the strategy for deploying non-verbal behaviours across contexts.

Figure 1. The two 3D animated salespersons of both genders

Conversational Function	Communicational Behaviour for Human-Like Facial Expression	Communicational Behaviour for Human-Like Body Gesture
Starting a conversation	Smile	Head nod, hands steeples
Presenting a product and its functionality	Smile, joyful, Interested or Positive-surprised	Left/Right hand Palm, and/or open palms , Index finger and walking
Using the product	Smile, Joyful, or Positive-surprised	Walking, Left/Right hand Palm
Listing to the Customer	Smile or interested	Head nod
Ending a conversation	Smile, Joyful	Head nod, waving hand, and/or walk

Table 5. Conversational Functions and communicational behaviours

Conclusion

With the goal of creating multimodal avatar with authentic emotional expressions, we have conducted an empirical study to observe the use of both facial expressions and body gestures by the salespersons in two retail stores. To facilitate the observational process, we have selected the most probable facial expressions and body gestures and incorporated them into a template.

In revisiting our research question on gender-specific non-verbal behaviour, results of our first study - in situ observations – indicate that there was no significant difference between female and male salespersons when interacting with customers in term of using positive, neutral and negative facial expressions and body gestures. In addition, it was estimated that there was no notable difference in the use of non-verbal cues when a salesperson, be it male or female, interacted with same-gender or opposite-gender customers. Nonetheless, owing to the relatively low number of customers and to the fact that the salesperson-customer pairing cannot be predetermined or controlled in a field study like that, no statistical tests can be applied. Not surprisingly, it was found that both female and male salespersons used positive and neutral facial expressions and body gestures more than negative ones.

Generally, the main results of the study reported here can support our future research work, where we aim to investigate the use of expressive multimodal avatar in B2C e-commerce websites of retailer stores and to compare the effects of different presentation modalities on customers' decision-making as well as overall satisfaction. Specifically, we plan to design and implement salesperson avatars of both genders with positive and neutral facial expressions and body gestures of the highest frequencies (e.g. smile, joy, and neutral facial expressions, and right hand palms, open palms and index finger body gestures) identified in the two studies reported above. To further enhance the acceptance of salesperson avatars, we also aim to design them with all possible conversational functions to present a product and its functionalities in a retail store's website (Table 5).

Implications and Future Work

Our research work presented here can deepen our understanding of customers' needs during their natural communications with salespersons. Results of the in situ observational study enabled us to interpret both customers' and salespersons' communicative behaviour in a more consistent way. Furthermore, the template – NEBOT – we developed consists of a range of common and, more important, validated (through another study not reported in this paper) positive, negative and neutral non-verbal cues. It can serve as a R&D tool for other domains such as e-learning and games design where expressive human-like agents are deployed for addressing their respective goals, for instance, virtual teachers in e-learning and virtual characters in narrative-based games.

The ultimate goal of our research is to investigate whether an expressive multimodal avatar can affect customers' decision-making when performing online shopping, and their overall satisfaction toward the online shopping experience. It has been found that the

emotional state of others during social interaction can influence the decision to be made [1]. Since human interaction is reflexive, humans interpret cues (e.g. facial expression and body gestures) in such a way as to defend a common vision of reality [20, 26].

In our future research work, we aim to focus on designing and implementing interactive multimodal user interfaces for B2C e-commerce websites with virtual avatars. Such avatars will be used to present information effectively and to fulfill several important functions for both verbal and non-verbal communications. Of particular research interest is to investigate the effect of multimodal avatars on consumers' decision-making from the perspective of user experience. Two avatars have been development using the DAZ studio (Figure 1) based on the findings of this study, and they will be used to investigate whether an expressive multimodal avatar can affect customer decision-making in online shopping and their overall user experience.

With regard to the future development of NEBOT, we aim to explore the possibility of implementing it with a mobile touch-screen device such as a tablet. The current paper-based version (A3-size) can provide a clear overview of the range of facial expressions and body gestures, but it is rather cumbersome to handle on one's lap when sitting in a corner with limited space. Besides, digital records are easier to retrieve as well. However, like all mobile devices, a smaller screen size may entail shifting certain parts of the template back and forth, slowing down the recording process. A compromise strategy needs to be identified.

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