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How rapidly does Intensive Interaction promote social engagement for adults with profound learning disabilities?

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The intervention of Intensive Interaction is gaining attention for its demonstrated effectiveness in promoting social engagement in individuals with severe communicative impairments. The present study sought to extend the evidence base for this intervention by investigating the rapidity with which an increase in engagement becomes apparent. Videotapes of the first Intensive Interaction session for 10 adults with profound learning disabilities were microanalytically coded for four measures of engagement: eye gaze, bodily orientation to partner, proximity to partner, and emotional valence. Results showed an increase for all participants on at least two measures, while 70% of the sample showed increases on all four measures. Such shifts occurred within only a few minutes of the onset of the session (ranging from three to 14 minutes). Non-parametric analyses confirmed that this robust pattern of increases would not have been predicted to occur by chance. These findings indicate that Intensive Interaction is effective in rapidly promoting social engagement, even for individuals with a long history of apparent social avoidance. Suggestions for future lines of enquiry, at both the empirical and conceptual levels, are discussed.

Keywords: learning disabilities; communicative impairment; intervention; social engagement; Intensive Interaction; imitation

The intervention of Intensive Interaction is gaining attention for its demonstrated effectiveness in promoting social engagement in individuals with communicative impairments. It has proven particularly effective for those with profound learning disabilities and global intellectual impairments (Coia and Jardine Handley 2008; Leaning and Watson 2006; Nind 1996; Nind and Kellett 2002; Watson and Fisher 1997). Recently, its use has expanded to include individuals with severe autism (Caldwell 2004, 2006; Nind 1999, 2000), elderly adults with advanced dementia (Astell and Ellis 2006; Ellis and Astell 2008), and children with a history of extreme neglect (Zeedyk et al., 2009; Davies et al. 2008). Most of the empirical evaluations published to date in the intellectual disabilities literature have tracked Intensive Interaction's outcomes over an extended period of time, with the aim of demonstrating sustained increases in social behaviour (e.g., eye gaze, smiling) and decreases in distress behaviour (e.g., banging, rocking). While such work is crucial in gathering a robust evidence base of Intensive Interaction's effectiveness, a longitudinal focus tends to obscure attention to questions about the rapidity with which Intensive Interaction begins to generate communicative

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improvements. The anecdotal evidence offered by practitioners (e.g., Caldwell 2004, 2006) strongly suggests that this is occurring as quickly as the first session of Intensive Interaction, even for adult clients who have a long history of social avoidance. The aim of the present study was to investigate this observation empirically, by using microanalytic behavioural analysis to track engagement in individuals with profound learning disabilities who were participating in Intensive Interaction sessions for the first time.

Intensive Interaction originated within the UK in the 1980s, developed initially by Ephraim (1986) and extended by Nind and Hewett (1994, 2001; Hewett and Nind 1998), who are now considered among the foremost theorists of the approach. The technique is a good example of what have come to be known as 'reciprocal' or 'interactive' approaches, which emphasise mutuality, affect, client-led activities, and a holistic focus on the meaning of behaviours for an individual. Other examples of reciprocal approaches include Co-Creative Communication (Hart 2006; Nafstad and Rodbroe 1999), Reciprocal Imitation Training (Ingersoll and Gergans 2007; Ingersoll and Schreibman 2006), Floortime Therapy (Wieder and Greenspan 2005), and Reciprocal Imitation (Nadel et al. 2000; O'Neill 2006). All of these approaches are theoretically and practically informed by knowledge about the nature of parent-infant communication (e.g., Beebe et al. 1985; Stern 1985; Trevarthen 1978), in which sensitive, reciprocal responses from a caregiver are seen as the foundation for inter-personal skills. Reciprocal approaches differ from more traditional behavioural intervention approaches in that interaction is much more flexible and spontaneous, its 'content' is co-constructed between the two partners rather than being directed by the practitioner, and behavioural change is seen as emerging from within the needs and motivations of the client rather than through reinforcement administered by practitioners (for further discussion of this contrast, see Ingersoll and Schreibman (2006)).

Empirical evaluations of Intensive Interaction's effectiveness have indicated that it successfully promotes engagement with a partner, as reflected in behaviours such as eye contact, emotional expression, and proximity, and that these changes can be maintained over time, as long as care staff continue to use Intensive Interaction when engaging with clients (e.g., Firth 2006; Nind 1996; Watson and Fisher 1997). Leaning and Watson (2006), for example, reported an increase in smiling and eye contact for all five members of a group of adults with profound learning disabilities, over an 8-week intervention programme. Attention has also been drawn to Intensive Interaction's effectiveness in reducing stereotypies and distressed behaviour (e.g., Caldwell 2006; Leaning and Watson 2006; Samuel and Maggs 1998). Nind and Kellett (2002) reported that, over a 6-week period working with four primary-school-aged children with special needs, an overall decrease occurred in the frequency of the children's rocking, hand biting, object throwing, and other behaviours indicative of distress. While such findings are encouraging, one of the gaps in the literature is empirical evidence documenting how quickly such changes begin to be manifested.

The present study sought to address that gap, by focusing on behavioural change during the first session of Intensive Interaction. We had two specific aims. The first was to determine how quickly noticeable increases in engagement become manifest. Is it indeed the case, as reported by practitioners, that significant shifts in social interaction are happening within the first session? We measured such engagement via four behaviours that both the infant (Beebe et al. 1985; Trevarthen 1978) and adult (Bailenson and Yee 2005; Mehrabian 2007) literatures have considered indicative of social interest: eye gaze to partner, bodily orientation to partner, proximity to partner,

and emotional state. We calculated whether the proportion of participants showing positive change in these behaviours over the course of the session, in comparison to those showing no or negative change, was greater than would have been expected to occur by chance. The second aim was to investigate individual differences in these patterns of change. Did engagement show a linear or fluctuating pattern of increase, and how much did such patterns of change differ across individuals? This was achieved by taking a multiple-case perspective, in which the trajectories of change were plotted separately for each participant.

The study focused on a sample of 10 adults who had extreme communicative impairments resulting from profound learning disabilities. A sample size of 10 was chosen because it was large enough to permit statistical analysis while not obscuring investigation of individual differences. Ten constitutes a sample larger than many previous reports of reciprocal interventions (Nobel 2002 ($n=1$); Ingersoll and Schreibman 2006 ($n=5$); Leaning and Watson 2006 ($n=5$); Kellett and Nind 2001 ($n=6$); Nadel et al. 2000 ($n=8$)), although studies adopting a comparative group design have sometimes included two groups of 10 (Escalona et al. 2002; Field et al. 2001; Heimann, Laberg, and Nordoen 2006).

Focusing on individuals at the extreme end of the impairment spectrum remains somewhat unusual within the intellectual disabilities literature. Many of the existing reports explore intervention outcomes for individuals at the higher-functioning end of the spectrum, such as those able to make use of symbolic communicative systems (e.g., Picture exchange communication system [PECS], Makaton) or to engage in theory of mind tasks (e.g., Baron-Cohen et al. 1997; Magiati and Howlin 2003; Standen and Low 1996). None of the participants in this study were able make use of such communicative systems and tasks. They were extremely socially avoidant, as demonstrated by the fact that staff felt they rarely (and in some cases never) engaged socially with others. All regularly presented behaviour that was interpreted by staff as distress, such as loud screaming, low-pitched moaning, or vigorous bursts of movement. Many also exhibited frequent periods of 'violent' behaviour, directed either toward themselves (e.g., biting hands, gouging eye sockets, banging their head against the wall) or other people (e.g., scratching, hitting, or kicking staff if they came too close). Staff had sought out Intensive Interaction as a possible means of reducing such distressed behaviour and improving the quality of participants' social engagement. In all cases, a range of interventions had been tried previously, but without positive outcomes. Thus, if this study succeeded in providing empirical evidence that Intensive Interaction was rapidly effective in promoting engagement, this would offer new potential for fostering communicative exchanges between individuals at the extreme end of the impairment spectrum and those who care for them.

Methods

Participants

Intensive Interaction sessions with ten non-linguistic individuals were analysed. All were adults (six female, four male), ranging in age from late teens to early 60s. No formal diagnoses were available for participants, although informal reports from staff suggest that diagnoses were likely to include autism, cerebral palsy, and global intellectual delay. Observation of behaviours exhibited in the videotapes support these classifications. While the availability of diagnostic information is regarded as preferable within the special needs literature, it was not necessary for meeting the

process-oriented aims of the present studies, especially given that we were working with individuals at the extreme end of the impairment spectrum for whom previous interventions had proven ineffective. Names in this report, used for the purpose of discriminating between individual cases, have been changed from originals to protect anonymity of participants.

Source and settings of videotaped material

The videos were drawn randomly from the archive of material owned by the second author, who supervised all the Intensive Interaction sessions analysed in this study. The videos had been made with the consent and collaboration of staff and guardians, for the purposes of training, education, and analysis. Intervention sessions (and thus filming) were carried out in the residential centres where participants lived or the day centres they attended, with the exception of one participant who was filmed at home (because he had been excluded from all local day centres, as a result of behaviour that staff found threatening and unpredictable). Staff and/or guardians were present throughout the session being filmed, as one of the purposes of the session was to provide them with training in the technique. Some of the cases included in this study have previously been described narratively (Caldwell 2004, 2006), and some videotape material is available within the public domain for training purposes (Caldwell 2005). The aim of the present study was to reanalyse this existing video material in greater detail than had previously been possible, using microanalytic techniques. The study was approved by the Research Ethics Committee of the University of Dundee.

Intervention technique

The technique of Intensive Interaction involves interacting with a person by using their own sounds and movements. The practitioner partner intently observes what his/her client partner is doing, and then 'joins in', using the same movements, vocalisations, and rhythms. Although various elements of the technique may be differentially emphasised by individual theorists (for example, Nind (1999) emphasises teaching pre-speech fundamentals such as turn-taking and eye-gaze to the client, while Caldwell (2004) emphasises the immersion of one's self in the body language of the client), Intensive Interaction is essentially a process of building a genuine relationship between the client and the practitioner partner. The aim is to respond to the client's interests, concerns, and behaviours, and for the client to come to recognise the practitioner's actions *as a response*. It has been suggested that such recognition becomes possible precisely because the responsive actions are so closely matched to those of the client, rendering them familiar and meaningful (e.g., Caldwell 2004; Coia and Jardine Handley 2008).

Some theorists (Caldwell 2006; Coia 2008; Zeedyk 2006) have drawn attention to the possibility that a client's recognition of a response may be occurring not only at the behavioural and psychological levels, but also at the neurological and physiological levels. This interpretation concurs with recent evidence concerning the role of mirror neurons in primate and human functioning (Rizzolatti et al. 1995). The sensory chaos that frequently accompanies communicative disorders (Bogdashina 2003; Horwood 2008; Ramachandran and Oberman 2006) may be exacerbated when other people use actions that are unfamiliar and uninterpretable to a client. The human brain seeks sensory stimuli that are meaningful and thus non-threatening. Anecdotal

evidence suggests that when these are supplied by another human being (via closely matching the client's body language) then the degree of sensory distress decreases sufficiently to allow the emergence of surprisingly high levels of inter-personal engagement.

Research design and procedure

The study employed an observational, multiple-case design, in which the behaviours of participants were examined both on a group basis and individually. The 10 intervention sessions analysed constituted the first occasion on which Intensive Interaction had been used with the clients. All sessions involved a practitioner and client engaged in social interaction, with the practitioner employing Intensive Interaction as a means of communicating with the client.

These introductory sessions of Intensive Interaction lasted between 30 minutes and several hours, ending when the client's energy levels had declined substantially. Throughout the sessions, brief 'breaks' emerged naturally, for example when ambulatory clients left their chair to walk across the room but then returned to the partner, or when immobile clients turned their head and attention away but shortly thereafter renewed their focus on the partner. Caldwell (2006) notes that this pattern of fluctuating attention is typical, attributing it to the demands that meaningful responsiveness places on cognitive and emotional resources. The client's disengagement serves as a form of physiological self-regulation, thus making it similar to the cyclical rhythms observable in parent–infant interaction (Beebe et al. 1985). Because breaks are always introduced by the client, and because they constitute natural pauses within an exchange, in the present study coding ceased when the first such break occurred. This was defined as either: (a) the client walking away from the practitioner for a period of 10 seconds or more; or (b) the practitioner judging that such a break was occurring and consequently temporarily withdrawing their own attention from the client for a period of 10 seconds or more. While imposing this conservative parameter presented the risk of missing further increases in engagement that might have occurred later in a session, its advantage was that it provided ecological consistency within the diverse behavioural set being examined here. The lengths of sessions analysed ranged from approximately 3 to 14 minutes, as shown in Table 1.

Table 1. Details of intervention sessions coded for each participant.

Participant	Length of sessions analysed (s)	Length of quarter-segments (s)
Kristin	424	106
Lily	177	44
Angus	288	72
Philip	366	91
Parvez	600	150
Carol	756	189
Nicholas	264	66
Lorna	480	120
Eva	476	119
Vivian	436	109

Coding

The aim of coding was to be able to chart increases, over the course of the sessions, in clients' interest in their partner. This was operationally defined via four behaviours that are indicative of social engagement: eye gaze, proximity, orientation, and emotional valence. As outlined later, each behaviour was coded for three hierarchically-related levels, which represented different degrees of engagement with the partner. The central aim of coding was to determine the proportion of time that was spent at each level of engagement. If engagement was increasing, then we expected to see more time being spent at higher levels of engagement as the session progressed.

Eye gaze to partner

The client's eye gaze toward the partner was coded as either: (a) away from the partner; (b) toward partner's body, but not face; or (c) toward partner's face.

Bodily orientation to partner

The orientation of the client's body in relation to the partner's body was coded as either: (a) away from partner; (b) oriented toward partner, but not directly facing partner; or (c) facing partner directly.

Proximity to partner

The proximity of the client to the partner was coded as either: (a) far (beyond touching distance); (b) close (within touching distance of one another, but not touching); or (c) touching. Shifts in proximity were coded only where they occurred as a result of the client's movements, not as a result of the practitioner's movements.

Emotional valence

The emotional valence of the client's actions was coded as either: (a) neutral/negative; (b) positive; or (c) very positive. Neutral and negative emotional levels were combined because negative emotion was very rarely observed in the set of videotapes analysed, and it was therefore considered most appropriate, empirically and methodologically, to collapse them.

Coding was conducted in accordance with standard microanalytic procedures. Each behaviour was coded separately. The time counter was set at 0.00 at the outset of the session, and coders then recorded the time at which there was a change in the level of engagement being exhibited. For example, the pattern of a participant's eye gaze might have been: 0.00 away from partner, 0.32 partner's hands, 0.47 partner's face, 0.52 partner's hands, 0.54 partner's face, etc., until the first natural break (as described earlier) occurred. The total amount of time that had been spent at each level of engagement (for each behaviour) was then determined by summing the relevant values.

A primary coder coded all the videotapes. Inter-rater reliability was assessed by having a second coder, blind to the hypothesis, code 20% of the total video footage (i.e., 14 minutes out of 71 minutes). This was equally distributed over four participants (3.5 minutes each), randomly chosen from the full sample of 10 participants. Within each segment chosen for inter-rater reliability analysis, all four variables were coded.

Mean intra-class correlations of the proportionate scores yielded by the two raters was 0.89 (range=0.84–0.92), indicating acceptable levels of reliability. The primary coder's data were used for analyses.

In the few instances where postural restrictions associated with a participant's disability prevented any possibility that change could have occurred in a variable, no coding was carried out. This decision was taken because it would have been ecologically invalid to interpret the lack of change in such cases as empirically meaningful. Using this criterion, three exclusions were made: Lorna, orientation and proximity; Nicholas, orientation.

Data analysis and presentation

In order to facilitate the study's aim of tracking patterns of engagement over the course of the session, we divided each session into four equal segments, constituting the chronological quarters of the session.¹ Adopting such a proportional structure allowed comparisons to be made among the patterns for the 10 participants, despite differences in the lengths of the segments analysed. Lengths of segments for each participant are shown in Table 1. The coded data were then converted into the proportion of time that a participant spent at each level of each variable, for each of the four segments of a session.

Data are provided in both tabular and graphic form in the present study. The tables provide a fully accessible and transparent data set, but their complexity makes it difficult to discern patterns of change within them. Thus, the primary presentation of the data is in graphic form (converted into Engagement Scores, as discussed later) in Figures 1 and 2. The more detailed tables are presented in Appendix 1, allowing interested readers to track the calculation of scores, should they wish to do so.

The extent to which a participant was socially engaged was determined by calculating an 'Engagement Index Score' for each segment of the session, using the following formula: (1) the three levels pertaining to a variable were assigned the *a priori* values 0, 0.5 and 1. These values capture the hierarchical and relational nature of the levels, with 0 representing non-engagement and 1 representing full engagement; (2) the raw proportional figures for each segment (provided in Appendix 1) were each multiplied by the associated values of 0, 0.5, or 1; (3) the three resulting outcomes were then summed to create a final overall Engagement Index Score for the segment. Separate scores were calculated for each variable.

In summary, this process yielded a score ranging between 0 and 100, which provided an index of the overall degree of engagement exhibited by a participant during each segment of a session, for each variable. A score of '0' would indicate that the participant had spent the entire segment at the lowest level of engagement for that behaviour and '100' that they had spent the entire segment at the highest level. While the nature of the scoring system meant that the scores of 0–100 did not map directly onto behaviours, they provided a weighted and relational basis on which patterns of change over the course of a session could be discerned and compared. Such amalgamated scores, while complex to calculate, generate a richer and more comprehensive reflection of engagement than do approaches that are more commonly used (because they are less laborious and more straightforward), such as counting the frequency of a target behaviour (e.g., smiles, imitative acts) or timing the length of a specific on-going behaviour (e.g., rocking, touching) Ingersoll and Gergans 2007; Leaning and Watson 2006; Nind and Kellett 2002).

Results

The central aim of the analysis was to determine how many participants showed an increase in engagement between the beginning and end of the sessions (Segments 1 vs. 4). Changes in Engagement Index Scores are depicted in Figure 1, analysed separately for each of the four variables. A predominant pattern of increasing engagement can be observed: over the full set of trajectories plotted in the four graphs (37 in total), only five failed to show an increase (three showed no change and two showed a decrease). This suggests the intervention has been effective in promoting engagement. In order to help in determining how reliably this effect can be attributed to the intervention, a non-parametric Fisher-Exact probability analysis (Siegel 1956) was carried out. A non-parametric test was judged most appropriate on the basis of the small sample size and the high degree of variability within the data set.

Accordingly, the change in Index Scores occurring between Segments 1 and 4, for each participant, was categorised as either an increase, decrease, or no change. The resulting distributions for each behavioural measure are shown in Table 2. These distributions were subjected to a one-tailed Fisher-Exact test, which revealed the likelihood of these distributions occurring by chance. Resulting probability values are also displayed in Table 2. Outcomes for all four measures of engagement confirm that the proportion of increases was significantly higher than would have been expected to occur randomly (all $p < .05$). This provides a strong indication that the increases in engagement can be attributed to the intervention, and that Intensive Interaction was having an effect on all four of the social behaviours measured.

A follow-up analysis looked at the patterns for each participant in more depth. Data were reconfigured on a case-by-case basis and for all four segments, as shown in Figure 2. These depictions of Engagement Index Scores show that the overall pattern of increasing engagement was subject to considerable variance. This was true for both amount of increase between Segments 1 and 4 (ranging from 4% to 80%), and for the trajectory of change during intermediate segments (i.e., consistently linear increases vs. fluctuating increases). This follow-up analysis also makes clear that *all* participants showed increases in at least some variables. Indeed, the majority ($n=7$) showed increases for all four measures (although in one case (Parvez), the slight increase that had occurred over the first three segments was followed by a decrease in the final one). For the remaining participants ($n=3$), there was a small sub-set of variables in which increases were never observed: Vivian's orientation remained static throughout, although at ceiling levels, thereby making increases impossible; Angus's orientation and proximity remained static throughout the session, both at a 'medium' level of engagement; and Carol's eye gaze dropped from initial levels, although it had begun to increase again by the end of the session. In summary, 100% of the participating

Table 2. Patterns of change in Index Scores between Segments 1 and 4 and the statistical probability of such a distribution occurring by chance.

Measure	<i>n</i> (total)	<i>n</i> (increase)	<i>n</i> (no change)	<i>n</i> (decrease)	Exact <i>p</i> -value
Emotion	10	9	0	1	.020*
Eye gaze	10	9	0	1	.020*
Orientation	8	6	2	0	.016*
Proximity	9	8	1	0	.004**

Note: * $p < 0.05$; ** $p < 0.01$.

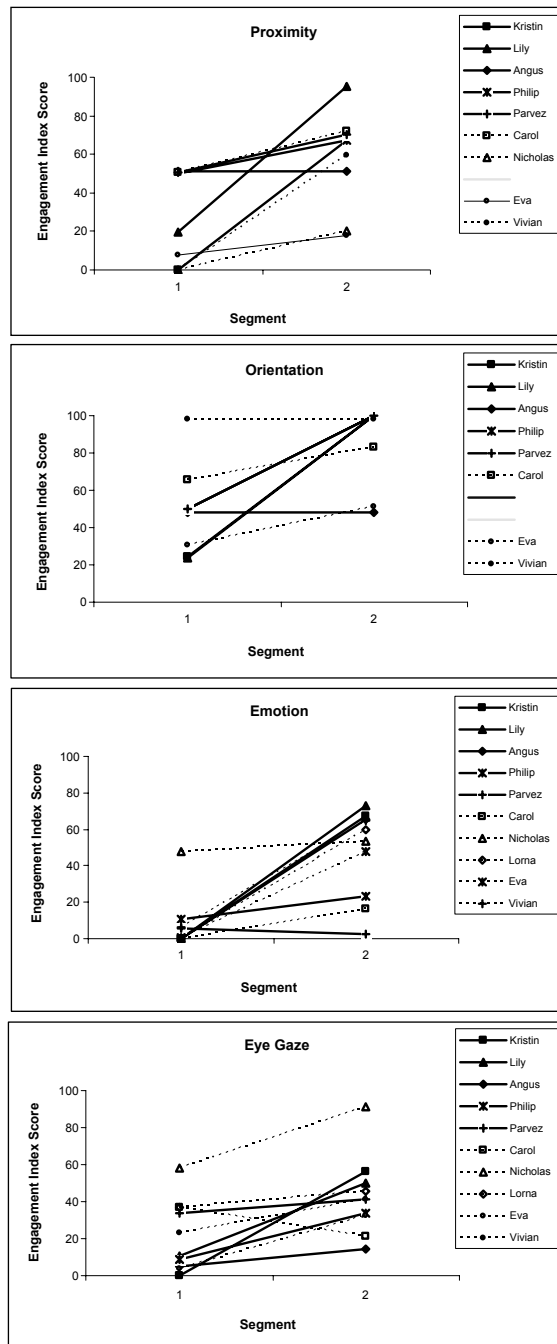


Figure 1. Patterns of change in engagement (as measured by Index Scores) between beginning and end of intervention sessions (Segments 1 vs. 4), by variable.

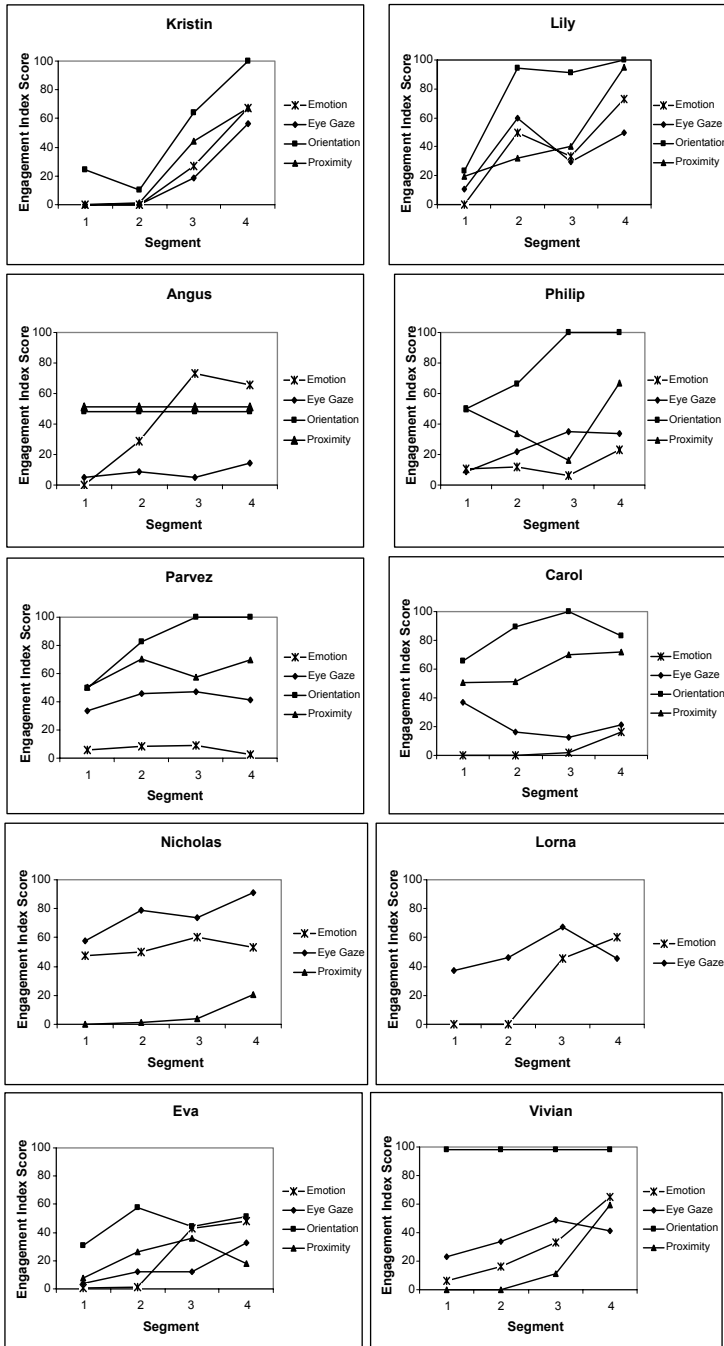


Figure 2. Patterns of change in engagement (as measured by Index Scores) during intervention sessions, by participant.

individuals displayed increases in engagement on at least some variables; 70% displayed increases on all variables. These findings support the earlier conclusion that Intensive Interaction facilitated significant increases in social engagement for this group, even within the brief time periods assessed in this study.

Discussion

This study has shown that the intervention of Intensive Interaction is effective in promoting social engagement in individuals with profound learning disabilities and communicative impairments. Well before the end of the first full intervention session, all 10 participants had demonstrated increases on at least two of the measures of engagement assessed – eye gaze, bodily orientation, proximity to their partner, and positive emotion – with the majority ($n=7$) showing increases on all four measures. This outcome was shown to be statistically significant for this sample size; positive change would not have been expected to occur by chance for this large a proportion of the sample. The finding that such changes should occur within minutes, for adults who have a long history of social avoidance, adds to the growing interest in the potential that Intensive Interaction holds for promoting communicative exchanges for individuals who are frequently excluded from such opportunities.

How confident, though, can we be that it is Intensive Interaction causing this effect? Might it be the case that any type of attentive social interaction would have yielded increases in engagement? To answer this question fully, future research needs to employ a design that compares Intensive Interaction to other forms of intervention as well as to standard, non-intervention interactions. A controlled design of that nature was not possible here, given that we were working with archive material of actual intervention sessions. However, researchers working with autistic children have carried out such experimental comparisons, using imitative techniques similar to Intensive Interaction, and have consistently found that imitation is more effective in facilitating engagement than is standard interaction or even enhanced, but non-behaviourally-matched, contingency (Escalona et al. 2002; Field et al. 2001; Heimann, Laberg and Nordoen 2006). Researchers working with other populations, specifically, adults with dementia and children suffering severe neglect, have also carried out controlled comparisons between standard and Intensive Interaction interactions, with the outcome that engagement was significantly greater in the Intensive Interaction condition (Ellis and Astell 2008; Davies et al. 2008). Such findings foster confidence that it is likely to be the matched responsiveness that is central to Intensive Interaction that facilitated the outcomes achieved here, rather than social interaction itself.

Furthermore, the absence of controlled comparative empirical evidence does not undermine the significance of the fact that by employing Intensive Interaction all participants had, within a matter of minutes, demonstrated increases in social engagement despite the severity of their communicative impairments and the disconnection that staff had historically felt from them. While it may seem surprising that dramatic outcomes could emerge in such a brief period, rapid responses have been shown in other studies. Heimann, Laberg and Nordoen (2006) obtained large shifts in autistic children's engagement after only 6 minutes of imitative interaction, and Nadel et al. (2000), Field et al. (2001), and O'Neill (2006) have done so after only three minutes of imitative interaction. While that body of work is limited in its relevance to the present findings, in that it focuses on autistic children, it does contextualise the present findings. The rapid shifts documented here are not unique. Future studies, in which

more detailed diagnostic information is available (which was not the case in this study), may be helpful in identifying whether there are particular types or degrees of impairment for which Intensive Interaction is most likely to yield swift outcomes.

The findings of the present study highlight conceptual issues surrounding the term 'engagement'. We tracked increases in four different behaviours. For how many of these is an increase required before it can be claimed confidently that an increase in engagement has occurred? Is a shift in eye gaze alone sufficient, or do increases need to be observed in all four behaviours to draw this conclusion? Such questions are important because they provide reminders that social interest in individuals with communicative impairments may take a more subtle form than in those considered 'non-impaired'. For clients who have a long history of social avoidance, an increase in proximity is notable, even if there was no accompanying increase in eye gaze, and such nuanced shifts should not be disregarded by observers. Having made this conceptual point, it is interesting that the present findings (see Figure 2) show there was rarely a call for such nuanced considerations in this study. For almost all participants, an increase was seen for all four variables. While the *rate* of increase may have differed across the four behaviours, it was rare to find a complete *lack* of increase for all of the behavioural variables. Engagement, as measured here, tends toward a gestalt nature, with behaviours shifting congruently, rather than independently. If a client's eye gaze shifted toward their partner's face, then their body orientation, proximity, and smiling were likely to follow suit. This suggests that the behaviours indicative of social engagement may not be so dissimilar for disabled and non-disabled people, at least under the right conditions. Future research thus needs to explore further what those conditions might be, and to consider why Intensive Interaction seems to be particularly adept at creating them.

The heightened emotional state fostered in these participants is particularly noteworthy. While Figures 1 and 2 reveal patterns of increasing positive emotion, they are unable to convey adequately the sense of joy exhibited by many of the participants as the sessions progressed. The videos contained scenes of participants hugging practitioners, faces 'lit up with delight', and shared laughter within the dyad. Van den Tillaart (2001) has made similar observations in her work with deafblind children and adults, using reciprocal techniques similar to Intensive Interaction. Her work has yielded interaction curves similar to those obtained here, but which she points out do not do justice to the emotional intensity and musculature tension that are present in both partners at climactic points of emotional involvement cycles. It is possible that matched reciprocity is particularly effective at creating what Stern (1985) calls a sense of 'communion', in which two people maintain a thread of feeling connected. This sense of communion is regarded as particularly crucial in infancy, because it provides a foundation on which other communicative functions are built. It may be that it serves a similar function for individuals with severe communicative impairments, who may rarely (or never) have previously experienced connection to other people. Indeed, imitative interaction, when employed in the non-rigid, affectively based manner envisioned by Intensive Interaction, seems to offer a primary means through which to facilitate what Fogel and Garvey (2007) call 'alive communication', a theoretical model that they have developed for understanding the dynamic processes that seem to be essential to the development of all communicative systems.

It is useful to close by pointing out the relevance of the present findings for work beyond the field of intellectual disabilities. The fields of psychology and neuroscience are increasingly interested in the pro-social effects of mirroring, imitation, and

attunement. This line of enquiry bears a strong affinity with Intensive Interaction, although the literatures rarely overlap. Current investigations include imitation's role in the development of language, self-awareness and empathy (Forman, Aksan and Kochanska 2004; Meltzoff 1990; Nagy 2006; Schore 2001), as well as imitation's contribution to affiliation, liking, and learning (Bailenson and Yee 2005; Byrne and Russon 1998; Van Baaren et al. 2004). Intensive Interaction theorists should be encouraged to think creatively about how the communicative gains they report can help to shed light on the broader set of phenomena discussed in the psychological literatures. For example, infancy work has traditionally been interested in infants' ability to *imitate*; the present findings demonstrate the powerful consequences of the converse of *being imitated* (Nadel 2002; Zeedyk 2006). Debates about the most appropriate label for this set of phenomena also continue to rumble (e.g., imitation, mirroring, copying, mimicking, parroting, attuning, affirmation?). The literature on Intensive Interaction holds the potential to help unravel such conceptual tangles. Perhaps most fundamentally, findings such as those reported here draw attention to the central role that communicative engagement plays in all human relationships. It is exciting to realise how easy it may be to build relationships, even with those who have long-lasting and severe communicative impairments because, as Coia and Jardine Handley (2008, 118) point out, 'without relationships the very essence of what makes life valuable drains away'. This is as true for people with learning disabilities as it is for those of us who are not classified in this way.

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Note

1. In preliminary work, we explored several possible segment lengths (e.g., thirds, quarters, sixths). It was concluded that the choice of segment length did not alter the overall pattern of outcomes. The final choice of quarter-segments was made because it constituted a straightforward presentational design.

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Appendix 1. Percentage of each segment spent at each level of engagement, by measure of engagement and by participant

Eye gaze to partner	Segment 1			Segment 2			Segment 3			Segment 4		
	Away from partner	Toward partner's body	Toward partner's face	Away from partner	Toward partner's body	Toward partner's face	Away from partner	Toward partner's body	Toward partner's face	Away from partner	Toward partner's body	Toward partner's face
Kristin	100	0	0	100	0	0	79	5	16	41	5	54
Lily	81	17	2	17	49	35	57	27	16	22	56	22
Angus	91	8	1	86	10	4	93	4	3	80	11	9
Philip	86	10	4	66	24	10	34	62	4	42	49	9
Parvez	43	47	10	23	63	14	17	72	11	23	72	5
Carol	35	56	9	76	16	8	80	15	5	66	26	8
Nicholas	42	0	58	21	0	79	26	0	74	9	0	91
Lorna	47	32	21	32	44	24	0	65	35	11	87	2
Eva	96	0	4	84	8	8	88	0	12	64	7	29
Vivian	77	0	23	66	0	34	51	0	49	59	0	41

Appendix 1. (Continued).

Bodily orientation to partner	Segment 1			Segment 2			Segment 3			Segment 4		
	Away from partner	Toward partner	Facing partner	Away from partner	Toward partner	Facing partner	Away from partner	Toward partner	Facing partner	Away from partner	Toward partner	Facing partner
Kristin	51	49	0	80	20	0	15	42	43	0	0	100
Lily	72	9	19	0	11	89	9	0	91	0	0	100
Angus	0	100	0	0	100	0	0	100	0	0	100	0
Philip	0	100	0	0	67	33	0	0	100	0	0	100
Parvez	0	100	0	0	35	65	0	0	100	0	0	100
Carol	0	69	31	3	15	82	0	0	100	2	30	68
Nicholas	-	-	-	-	-	-	-	-	-	-	-	-
Lorna	-	-	-	-	-	-	-	-	-	-	-	-
Eva	51	37	12	21	42	37	36	39	25	29	40	31
Vivian	0	0	100	0	0	100	0	0	100	0	0	100

Appendix 1. (Continued).

Proximity to partner	Segment 1			Segment 2			Segment 3			Segment 4		
	Far	Close	Touching	Far	Close	Touching	Far	Close	Touching	Far	Close	Touching
Kristin	100	0	0	97	3	0	12	88	0	0	66	34
Lily	72	17	11	36	64	0	19	81	0	0	10	90
Angus	0	100	0	0	100	0	0	100	0	0	100	0
Philip	0	100	0	33	67	0	67	33	0	12	42	46
Parvez	21	57	22	0	59	41	0	85	15	3	54	43
Carol	5	89	6	3	92	5	0	60	40	4	48	48
Nicholas	100	0	0	97	3	0	92	8	0	59	41	0
Lorna	-	-	-	-	-	-	-	-	-	-	-	-
Eva [first segment fig's don't add up to 100]	74	15	0	52	44	4	49	30	21	64	36	0
Vivian	100	0	0	100	0	0	82	14	4	0	81	19
Emotion	Neutral	Positive	Very positive	Neutral	Positive	Very positive	Neutral	Positive	Very positive	Neutral	Positive	Very positive
Kristin	100	0	0	100	0	0	46	54	0	0	66	34
Lily	100	0	0	0	100	0	33	67	0	10	34	56
Angus	100	0	0	43	57	0	0	54	46	0	69	31
Philip	79	21	0	76	24	0	88	12	0	66	22	12
Parvez	91	7	2	88	7	5	88	6	6	96	3	1
Carol	100	0	0	100	0	0	96	4	0	67	33	0
Nicholas	35	35	30	15	70	15	6	67	27	10	73	17
Lorna	100	0	0	100	0	0	48	13	39	11	58	31
Eva	99	1	0	97	3	0	30	54	16	16	72	12
Vivian	88	12	0	68	32	0	48	38	14	31	48	21