Love Is All You Need: User Preferences of Strategies for Mediating Intimate Relationships Through Technology

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Maintaining a sense of relatedness with loved-ones is one of the top human needs and predictors of wellbeing. HCI research has increasingly focused on the ways and implications of *mediating* relatedness through technology. However, current research is at times removed from established theories in related disciplines and it lacks consistent tools for selecting user groups and appropriate interaction strategies. Our paper identifies the characteristics of potential users of tech-mediated devices in conjunction with related disciplines. It then examines users' preferences for the six *Strategies of Mediating Intimate Relationships though Technology*, identified by Hassenzahl et al. in the paper "*All you need is Love*", in interaction within different types of relationships (with friends, partners, siblings, etc.). Our paper proposes expanding these strategies to account for varied levels of reciprocity and for essential/unwanted strategies identified by users in different types of relationships. It concludes with implications and suggestions for future research.

Computer-mediated relationships, attachment, relatedness, secure base, experience design, positive computing.

1. INTRODUCTION

1.1 Computer-Mediated Intimate Relationships

It is widely agreed that "love, and general feeling of being related to significant others are crucial to people's life satisfaction and happiness" (Hassenzahl at al., 2012), and that maintaining the sense of *relatedness* (also known in HCI as *connectedness*, *intimacy*, *love*, *belonging*, *closeness*, or *togetherness*) is one of the top human needs (Sheldon et al., 2001). There are many means of communication that help loved-ones to stay in touch, from analogue keepsakes and letters to video-conferencing and complex social networks (Wright & Webb, 2010). Among these, there is a subset of augmented keepsake-like artefacts that enhance the sense of *relatedness* to loved-ones (LO) and maintain their *psychological closeness*.

Hassenzahl et al. reviewed and consolidated prior research within HCI on *Computer-Mediated Intimate Relationships* (Hassenzahl at al., 2012). Authors pointed out gaps in the knowledge, highlighted inconsistencies in tools and methodologies, and the lack of incorporation of established research from other related disciplines. Summarizing the approaches described in previous HCI papers, the authors identified six reciprocal strategies employed by researchers for designing artefact that mediate intimate relationships through technology (Figure 1).
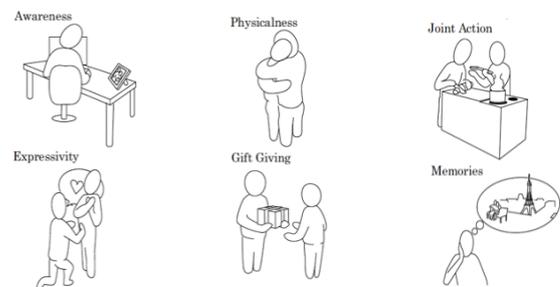

Figure 1: *Current Strategies for Mediation of Intimate Relationships Through Tech. (Hassenzahl at al., 2012)*

1.2 Theory of Intimate Relationships

Attachment Theory is the core motivational and behavioural system that can explain someone's intimate relationships (Hazan & Shaver, 1994). It is used as a base for understanding communication between relational figures (including communication via analogue and technological artefacts).

Relational figures vary, but are predominantly represented by parents, offsprings, grandparents, grandchildren, siblings, best friends and romantic partners (Table 1).

Table 1: List of common Relational Figures (loved-ones)

Relationship	Female	Male
Partner	*Girlfriend/Wife*	*Boyfriend/Husb*
Friend	*Female Friend*	*Male Friend*
Sibling	*Sister*	*Brother*
Parent	*Mother figure*	*Father figure*
Offspring	*Daughter*	*Son*
Grandparent	*Grandmother*	*Grandfather*
Grandchild	*Granddaughter*	*Grandson*
Other	*Other F*	*Other M*

Attachment is defined as the ability to use one's relational attachment figure as a *secure base* from which to explore the world. In this context, perceived proximity and availability of ones loved-ones lead to increased wellbeing and living a bigger, richer life (Feeney & Collins, 2014).

Over 60% of people can be characterized as *securely attached* (Mickelson et al., 1997), which means that they are comfortable depending on others and having others depend on them. The other two main attachment styles are: *avoidant* or *dismissive* and *anxious-ambivalent* or *preoccupied* (Bartholomew, 1990).

Although the relationships are dynamic (Knapp, & Daly, 2011), generalized *attachment styles* tend to be consistent over one's lifespan (Fraley, 2002). However, the specific manifestation of these *attachment styles* could be different for different relational figures (Hazan & Shaver, 1994). For example, someone could have the generalized tendency to trust *romantic partners*, thus having a *secure* attachment style towards them, but they may have an *avoidant* relationship with one of *parents*.

1.3 Motivation

From the *secure base* perspective, the role of a successful artefact that enables tech-mediated communication is to increase the *perceived availability* of the loved-ones and to reduce *anxiety* and *avoidance* using relevant mediation strategies. Although the strategies identified by Hassenzahl et al. were instrumental in establishing a common ground in the field, it focused on the strategies used by researchers and designers. To date, we are not aware of any work that has been done to examine these strategies from the perspective of users of tech-mediated artefacts. In this paper we intend to fill this gap, starting from identifying the characteristics of the users of such artefacts.

In view of the Attachment Theory, in design of the systems for mediating intimate relationships, it is not only important to consider the immediate user, but also a type of user-pair (dyad). Several studies, examined by Hassenzahl et al. and some newer studies that followed since involved *friends* and

family members. However, most studies focused on *romantic partners*, often in long-distance relationships (LDR). Despite being specific about types of dyads, these studies do not investigate or discuss differences in preferences of these strategies among different dyad types.

In the context of intrapersonal communication, expectations of communication, as well as the levels and willingness of self-disclosure affect the dynamics of communication between people (Knapp, & Daly, 2011). Similarly, *receiving (From)* and *sending (To)* communication are distinctly different actions with different motivational triggers and potential outcomes. Thus, strategies could be described as shown in Table 2.

Table 2: Directions of Mediation Strategies

Strategy	Possible Direction of Strategy		
Awareness	*Reciprocal*	*From LO*	*To LO*
Expressivity	*Reciprocal*	*From LO*	*To LO*
Physicalness	*Reciprocal*	*From LO*	*To LO*
Gift Giving	*Reciprocal*	*From LO*	*To LO*
Memories	*Reciprocal*	*From LO*	*To LO*
Joint Action	*Reciprocal*	*n/a*	*n/a*

The strategies that might appear to be reciprocal may not be equally desired by both parties within specific types of relationships. However, neither research, examined by Hassenzahl et al., nor work that came out since consider possible differences in the preferences for asymmetrical engagement.

Furthermore, consistent with theories within Relationship and Communication Psychology (Duck, 2007), it is reasonable to assume that different mediation strategies will have different levels of importance for different relational figures and will depending on the quality of relationship and frequency of seeing each other. For example, sharing *Memories* might be equally preferred by all relational dyads, but *Physicalness* might be preferred more by *romantic partners* than by *friends* or *siblings* who might prefer *Joint Action* instead.

2. RESEARCH AIM

There are two main aims of this research. The first aim is to understand the characteristics of the people that would like to engage with augmented artefacts for mediation of their relationships (users). The second, is to examine how these users prefer to engage with the variety of their loved-ones through these artefacts, using the current set of six *mediation strategies* (Hassenzahl at al., 2012) (Figure1) as a base. As such, we intend to explore following research questions:

2.1 Questions: Users Characteristics

Q1: What relational figures do people miss the most when they are apart?

Q2: Do types of relational dyads, gender of relational figures, quality of the relationship, or frequency of seeing relational figure affect the desire to using augmented keepsake artefacts to stay in touch with relational figures?

2.2 Questions: Preferences of Mediation Strategies

Q3: Are mediation strategies inherently *reciprocal*? Or are they directional? For example: users who want to be *Aware* of their loved-ones, might not want to disclose the same information about themselves.

Q4: Are all mediation strategies equally *essential*? Or are there are some strategies that users find more *essential* than others, or perhaps *do not want* at all?

Q5: Do all types of dyads equally prefer the same types of strategies? Or do people in different types relationships, such as with *romantic partners*, *friends* and different *members of the family* prefer their relationships mediated through different combinations of strategies? For example: *Physicalness* might be most important strategy for *romantic partners*, whereas *Awareness* for might be for *offsprings*.

3. STUDY

3.1 Method

To unpack our research aims, we deployed a semi-structured online questionnaire to participants, interested in keeping in touch with their loved-ones. The questionnaire was designed to obtain insights into the characteristics of potential users of augmented artefacts for mediation of relationship with common relational figures and their preferences for mediation strategies. We rephrased original descriptions (Hassenzahl at al., 2012) to remove technical terms and make them accessible to participants (Table 3).

To account for potential differences in the preference for asymmetrical engagement, we gave *To* and *From* directions to six current mediation strategies, described by Hassenzahl et al. Using logic-based platform, participants were asked if they had a particular relational figure, for example: *Do you have a sister? Yes / No.* If they answered *Yes* and had more than one, they were asked to pick their favourite and invited to do following: *"Imagine, you have a very special object that lets two of you to keep in touch without having to call or write by using following scenarios:"*, followed by the directional descriptions of *Mediation Strategies* (Table 3).

Table 3: Revised Description of Mediation Strategies.

Strategy	Description
Awareness (To)	*Get a constant feeling of your loved-one's presence, through knowing her moods, activities, whereabouts, environment (weather, sounds), etc..*
Awareness (From)	*Continuously share your moods, whereabouts, activities and environment so that loved-one might feel your presence?*
Expressivity (To)	*View or feel a secret coded message when your loved-one lets you know that she is thinking of you, that she is happy, that she misses you, etc…*
Expressivity (From)	*Discreetly send a secret coded message to let your loved-one know you are thinking of her, that you are happy, that you miss her, etc…*
Physicalness (To)	*Experience your loved-one's physical gestures, like hugs, gentle strokes, etc... or her physical state, like body heat, heartbeat, etc...*
Physicalness (From)	*Transmit your physical gestures or physical state to your loved-one.*
Gift Giving (To)	*Receive a gift from your loved-one, such as a song, a photograph, directions to some special pace, etc..*
Gift Giving (From)	*Send a gift to your loved-one*
Memories (To)	*Revisit memories of special moments of you and your loved-one through sounds, smells, images, etc…*
Memories (From)	*Record and keep new special moments of you and your loved-one.*
Joint Action (To & From)	*Do things together with your loved-one over distance, like play a game, listen to the same song, etc…*

Participants were then asked to rate these scenarios on a 4-point Likert scale ranging from "*essential"*, to "*I would not want this*". Following this, participants were asked if they were interested in having such object for communication with this person; and if so, what this object might be. Participants were also asked to rate the quality of the relationship they had with this person on a scale from "*Love very much*" (10) to "*Neutral*" (0) to "*Not good*" (-2 or less). Finally, they were asked to indicate how frequently they usually see this person on a 5-point Likert scale from "*Daily*" to "*Every few years*".

The set of questions repeated for each category of relational figures in Table 1. The questionnaire concluded by asking whom participants *missed the most* when apart, and demographic questions about participant's *age* and *gender*. Participants were given an opportunity to also leave an open comment about any aspects related to this study.

3.2 Results: Participants

We received complete responses from 147 participants (63 of whom identified themselves as *male*, 81 as *female* and 3 as *other*). Due to the low count of *other*, we removed them from further calculations, leaving us with 144 participants. The median age of the participants was 32.5 (20 min and 85 max and five outliers: 58, 59, 61, 65, 85 which we retained as we did not looking at the age as a factor in mediation of relationships.

3.3 Results: Relational Dyads

3.3.1 Reported types of relational figures

Overall, participants reported 609 types of relational figures (260 males, 377 females and 2 other) (Figure 2) with median of 5 types per participant (1 min, 10 max and no outliers). In addition to common relational figures (Table 1), under *other* (3) participants reported *niece*, *god* and *pet*.
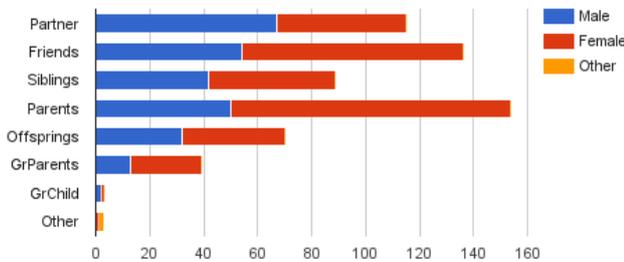

Figure 2: *Reported types of relational figures*

Q1: Reported types of most-missed loved-ones

Only a quarter (114) of all reported relational figures were most-missed. *Partners* were by far the most prominent most-missed group (88), followed by *offsprings* (18), *parents* (14) and *friends* (11) (Fig 3).
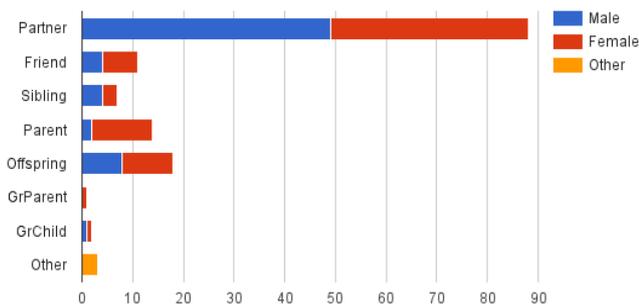

Figure 3: *Most-missed relational figures*

There was a significant difference between *reported* and *most-missed* relational figures. (χ^2 (1, N=702) = 108.9143; p-value = 0.00001< .05).

Information provided for four of the relational figures was incomplete, and these were removed from further analysis, as were *grandchildren* (3) and *others* (3) categories whose counts were less than 6, required for chi-square statistic. Resulting data

was arranged by gender into dyads, with participants (potential users) followed by potential loved-ones (Table 4).

Table 4: *Reported types of relational dyads by gender*

User - LO	M-M	M-F	F-M	F-F	Total
Partner - Partner	2	44	64	2	**112**
	2%	39%	57%	2%	100%
Friend - Friend	37	25	17	57	**136**
	27%	18%	13%	42%	100%
Sibling - Sibling	13	16	29	31	**89**
	15%	18%	33%	35%	100%
Parent - Offspring	10	9	23	28	**70**
	14%	13%	33%	40%	100%
Offspring - Parent	21	43	29	60	**153**
	14%	28%	19%	39%	100%
Grandchild - Grandparent	6	9	7	17	**39**
	15%	23%	18%	44%	100%
Total	**89**	**146**	**169**	**195**	**599**
	15%	24%	28%	33%	100%

3.3.2 Quality of relationships

Participants were asked to rate their relationship with a person in each relational dyad from 10 ("*Love very much*") through 0 ("*Neutral*") to -2 and below ("*Not good*"). Responses were aggregated into 3 categories Loving (7 to 10), Good (3 to 6) and Poor (below 3). Over 70% (428) of relationships were Loving, 9% (55) of relational dyads were reported to be Poor, and remainder (116) Good (Figure 4).
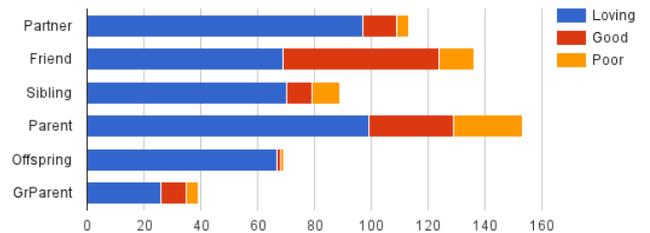

Figure 4: *Quality of relationship with relational figures*

3.3.3 Frequency of Seeing Loved-ones

Participants were asked to rate the frequency of seeing a person within the relational dyad from 1 (*Every few years*) to 5 (*Daily*). The biggest group (about 34%, 204) of dyads reported to see each other "*Daily*", followed by "*Few times a year*" (130), "*Few times a month*" (109), "*Few times a week*" (80) and "*Every few years*" (76) (Figure 5).

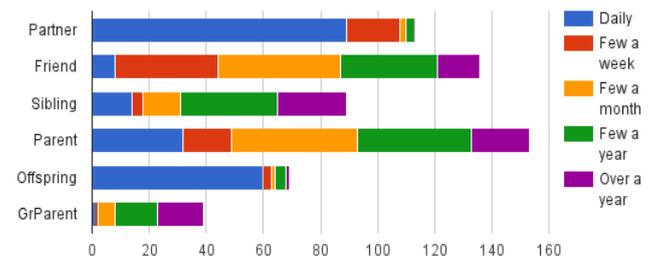**Figure 5:.** *Frequency of seeing relational figures*

3.4 Results: User Characteristics

To determine who the users of the mediated artefacts might be, participants were asked whether they *want* or *do not want* to have a special keepsake object that allowed them to keep in touch with a particular person that they reported without having to call or write. Resulted data was aggregated by dyad characteristics (Table 5).

Table 5: *User Characteristics for desire to have keepsake*

Characteristics		Want	Not Wa	Total
Dyad: User – LO	Partner - Partner	111 99%	1 1%	**112** 100%
	Friend - Friend	103 76%	33 24%	**136** 100%
	Sibling - Sibling	66 74%	23 26%	**89** 100%
	Parent - Offspring	118 77%	35 23%	**153** 100%
	Offspring - Parent	67 96%	3 4%	**70** 100%
	GrChld- GrParent	28 72%	11 28%	**39** 100%
TOTAL		**493** **82%**	**106** **18%**	**599** **100%**
Gender U-L	Female - Female	162 83%	33 17%	**195** 100%
	Female - Male	146 86%	23 14%	**169** 100%
	Male - Female	124 15%	22 15%	**146** 100%
	Male - Male	61 31%	28 31%	**89** 100%
TOTAL		**493** **82%**	**106** **18%**	**599** **100%**
Quality	Loving (7-10)	393 92%	35 8%	**428** 100%
	Good (3-6)	76 66%	40 34%	**116** 100%
	Poor (2 & below)	24 44%	31 56%	**55** 100%
TOTAL		**493** **82%**	**106** **18%**	**599** **100%**
Frequency	5 - Daily	193 95%	11 5%	**204** 100%
	4 - Few a week	72 90%	8 10%	**80** 100%
	3 - Few a month	81 74%	28 26%	**109** 100%
	2 - Few a year	98 75%	32 25%	**130** 100%
	1 – Every few years	49 64%	27 36%	**76** 100%
TOTAL		**493** **82%**	**106** **18%**	**599** **100%**

Q2a: Desire by Type of Relational Dyad

Participants wanted to use an augmented keepsake for interaction with 82% (493) of relational figures (Figure 6). There was no significant difference between individual types of dyads, but *partners* and *parents* were more likely to want an augmented keepsake than the rest of the groups (χ^2 (1, N=599) = 43.12; p-value = 0.00001 < .05)

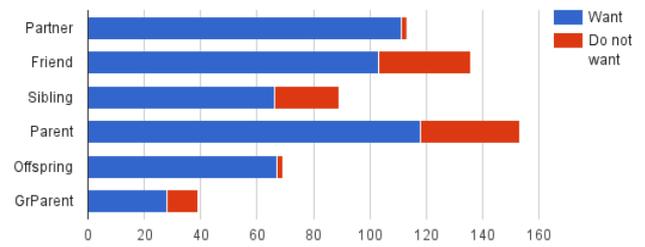*Figure 6*: *Desire to have keepsakes by relational figures*

Q2b: Desire by Gender

Overall, there was no significant difference between the preferences to use the keepsakes based on the gender of the participants. Similarly, when looking at relational dyads, there was no significant difference between pairs that have at least one female. However, reported male-male dyads were significantly less inclined to want keepsakes than all others (χ^2 (1, N=599) = 13.60; p-value = 0.000226 < .05).

Q2c: Desire by Quality of Relationships

The chi-square test indicates that quality of relationship influences the desire to use augmented keepsake for communion with a relational figure (χ^2 (1, N=599) = 105.53; p-value < 0.00001 < .05), with better relationship making keepsakes more desired.

Q2d: Desire by Frequency of Seeing Relational Figure

When comparing desire for the keepsakes based on the frequency of seeing each other, there was no significant difference between individual groups of people who see their relational figure "*Few times a month*" or less (groups 1, 2 and 3). Similarly, there was no significant differences between groups of people who see their loved-one "*Few times a week*" or more often (groups 4 and 5). However, people who see their loved-ones "*Few times a week*" or more often, were more likely to want a keepsake than people who see each other less than "*Few times a month*" (χ^2 (1, N=599) = 44.92; p-value < 0.00001 < .05).

3.5 Results: Preferences of Mediation Strategies

To get a clear user perspective on *Mediation Strategies*, we removed from further analysis all relational dyads in which participants *did not want* to have the augmented keepsakes, leaving us with 493 relational dyads (Table 6).

Participants were asked to imagine that they had a very special object that lets them keep in touch with a particular loved-one through the use of scenarios in Table 3. They were then asked to rank the

Table 6: *Reported types of relational dyads by gender*

User - LO	M-M	M-F	F-M	F-F	Total
Partner - Partner	*2* 2%	*42* 38%	*65* 59%	*2* 2%	*111* 100%
Friend - Friend	*24* 23%	*20* 19%	*13* 13%	*46* 45%	*103* 100%
Sibling - Sibling	*11* 17%	*11* 17%	*20* 30%	*24* 36%	*66* 100%
Parent-Offspring	*8* 12%	*9* 13%	*22* 33%	*28* 42%	*67* 100%
Offspring-Parent	*14* 12%	*35* 30%	*22* 19%	*47* 40%	*118* 100%
GrChld-GrParent	*2* 7%	*7* 25%	*4* 14%	*15* 54%	*28* 100%
Total	*61* 12%	*124* 25%	*146* 30%	*162* 33%	*493* 100%

importance of these scenarios from *I would not want this*, *Ambivalent* and *Essential*. All instances of *2-way From* and *2-way To* that occurred simultaneously within the same dyad (Table 7) were labelled as "*Reciprocal*" and given a single score.

Q3: Reciprocity of Mediation Strategies

Most current studies of mediation of intimate relationships use *reciprocal* strategies. Both Figures 7 and 9 clearly illustrate the importance of reciprocity. However, when looking at mediation strategies (excluding inherently reciprocal *Joint Action*), the difference between *reciprocal* and *one-directional* (non-reciprocal) strategies for both *essential* and *unwanted* cases was significant. (*Essential*: χ^2= 12.06; p-value < 0. 017 < .05; *Unwanted*: χ^2 = 30.36; p-value < 0.00001< .05).

Q4a: Essential Mediation Strategies.

Current studies on mediation of intimate relationships do not address the differences in importance of the strategies, suggesting that the strategies are *equally wanted* within all relational dyads. Using this as an underling assumption, for 493 dyads, we could anticipate 989 instances for each of the six original strategies (493 for *From*, 493 for *To* directions) with 100% *essential*. Instead, when looking at the total ranking of all strategies, only about 33% (1,966) of all possible instances of *From* and *To* were identified by participants as *essential* (Figure 7).
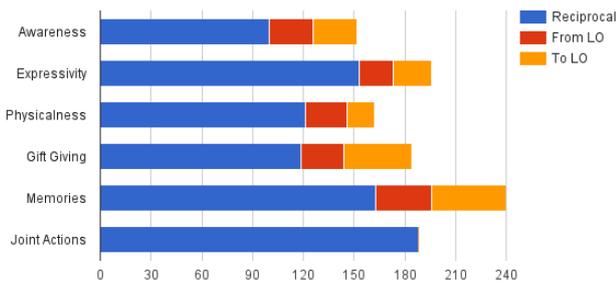

Figure 7: *Essential* Mediation Strategies *scores*

Table 7: *Summary of reported* From & To *Strategies*

Reported Strategy			Esse ntial	Ambiv alent.	Not wantd	Total
Awareness	*1way*	*From*	*26* 3%	*38* 4%	*9* 1%	*73* 7%
		To	*26* 3%	*30* 3%	*17* 2%	*73* 7%
	2way	*From*	*100* 10%	*211* 21%	***109*** 11%	*420* 43%
		To	*100* 10%	*211* 21%	***109*** 11%	*420* 43%
TOTAL			*252* 26%	*490* 50%	*244* 25%	*986* 100%
Expressivity	*1way*	*From*	*20* 2%	*30* 3%	*8* 1%	*58* 6%
		To	*23* 2%	*28* 3%	*7* 1%	*58* 6%
	2way	*From*	***153*** 16%	*216* 22%	***66*** 7%	*435* 44%
		To	***153*** 16%	*216* 22%	***66*** 7%	*435* 44%
TOTAL			*349* 35%	*490* 50%	*147* 15%	*986* 100%
Physicalness	*1way*	*From*	*25* 3%	*26* 3%	*14* 1%	*65* 7%
		To	*16* 2%	*36* 4%	*13* 1%	*65* 7%
	2way	*From*	*121* 12%	*210* 21%	***97*** 10%	*428* 43%
		To	*121* 12%	*210* 21%	***97*** 10%	*428* 43%
TOTAL			*283* 29%	*482* 49%	*221* 22%	*986* 100%
Gift Giving	*1way*	*From*	*25* 3%	*38* 4%	*16* 2%	*79* 8%
		To	*40* 4%	*38* 4%	*2* 0%	*79* 8%
	2way	*From*	*119* 12%	*280* 28%	*15* 2%	*414* 42%
		To	*119* 12%	*280* 28%	*15* 2%	*414* 42%
TOTAL			*303* 31%	*636* 65%	*47* 5%	*986* 100%
Memories	*1way*	*From*	*33* 3%	*51* 5%	*9* 1%	*93* 9%
		To	*44* 4%	*38* 4%	*11* 1%	*93* 9%
	2way	*From*	*163* 12%	*216* 22%	*21* 2%	*400* 41%
		To	*163* 12%	*216* 22%	*21* 2%	*400* 41%
TOTAL			*403* 41%	*521* 53%	*62* 6%	*986* 100%
Joint Action	*1way*	*From*	*0* 0%	*0* 0%	*0* 0%	*0* 0%
		To	*0* 0%	*0* 0%	*0* 0%	*0* 0%
	2way	*From*	***188*** 19%	*263* 27%	*42* 4%	*493* 50%
		To	***188*** 19%	*263* 27%	*42* 4%	*493* 50%
TOTAL			*376* 38%	*526* 53%	*84* 9%	*986* 100%

Overall, the reported *essential* mediation strategies, were distributed differently from strategies currently

used by researchers (Figure 8). Most frequently reported *essential* mediation strategies were *Reciprocal Joint Action* (188), *Reciprocal Memories* (163) and *Reciprocal Expressivity* (153).
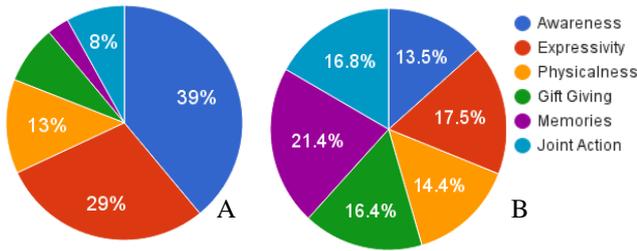

Figure 8: Original Mediation Strategies [presentation of Hassenzahl at al., 2012] (A) & Reported Essential Mediation Strategies (B)

Q4b: Unwanted Mediation Strategies.

As with *essential* strategies, we could anticipate 0% of *unwanted* strategies. Instead, near 14% (805) were identified as "*I would not want this*" (Figure 9). The most frequently reported *unwanted* mediation strategies were *Reciprocal Awareness* (109), *Reciprocal Physicalness* (97) and *Reciprocal Expressivity* (66).
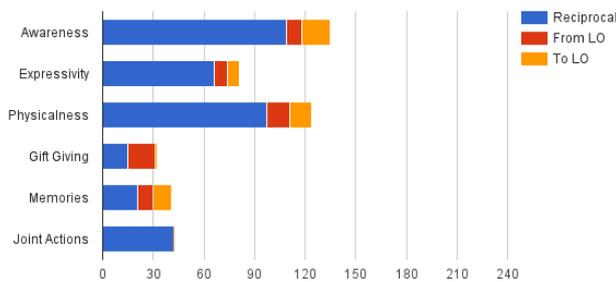

Figure 9: Unwanted Mediation Strategies

Q4c: Ambivalent Mediation Strategies.

Similarly, we would not anticipate seeing any ambivalence in the preferences for mediation strategies. Yet near half of (3,145) of all possible instances of *From* and *To* were identified by participants as *ambivalent* (Table 7).

Q5: Dyad Preferences of Expanded Mediation Strategies

Responses for *essential*, *ambivalent* and *unwanted* strategies in Table 7 were aggregated by the types of relational dyads. The contingency table was normalized based on the percentage based on the number of times the *original mediation strategy* was reported in an individual relational dyad. Percentage numbers were converted into Preference scores. (Table 8).

Based on the medians of the normalized scores, the overall *unwanted* scores were much smaller than *essential* scores. *Joint Action* (*M*=20), *Reciprocal Memories* (*M*=18) and *Reciprocal Expressivity*

Table 8: *Preference Scores for* Expanded Mediation Strategies *within specific types of relational dyads (green = top 3 essential for specific dyad, red = top 3 unwanted for specific dyad)*

		Partner-Partner		Friend-Friend		Sibling-Sibling		Parent-Offspring		Offspring-Parent		GrChld-GrParent	
Expanded Mediation Strategies		Essential	Unwanted	Essential	Unwanted	Essential	Unwanted	Essential	Unwanted	Essential	Unwanted	Essential	Unwanted
Awareness	Recip	12	**4**	6	**13**	4	**17**	28	**7**	8	**16**	2	**11**
	From	3	-	1	2	4	-	4	-	2	1	2	-
	To	5	2	2	1	1	2	1	3	3	2	2	-
Expressivity	Recip	**23**	1	9	**8**	**13**	**10**	**30**	4	**10**	**10**	5	**9**
	From	2	-	2	1	1	2	-	1	4	-	2	-
	To	3	1	1	2	1	1	1	-	3	-	5	-
Physicalness	Recip	**19**	2	6	**16**	5	**14**	29	6	8	**11**	7	**13**
	From	7	2	-	2	1	2	1	-	2	1	4	-
	To	2	-	-	1	2	1	2	1	2	3	4	2
Gift Giving	Recip	12	1	**10**	1	6	1	25	1	10	3	**9**	2
	From	5	-	1	3	2	2	1	-	3	3	2	2
	To	2	-	2	-	2	-	6	-	7	-	7	-
Memories	Recip	15	1	**11**	3	**13**	2	**33**	-	**15**	4	**20**	2
	From	4	-	3	2	5	1	-	1	4	1	2	-
	To	7	1	4	1	2	2	4	-	4	1	5	-
Joint Action	Recip	**23**	3	**17**	3	**18**	5	**30**	1	**13**	8	**16**	2
	From	-	-	-	-	-	-	-	-	-	-	-	-
	To	-	-	-	-	-	-	-	-	-	-	-	-

(*M*=15) were the top three most *essential* strategies. And *Reciprocal Awareness* (*M*=11), *Reciprocal Physicalness* (*M*=10) and *Reciprocal Expressivity* (*M*=7) were the least wanted strategies.

When looking at *essential* and *unwanted expanded mediation strategies* within specific dyads in Table 8, *parents* (in communication with their *offsprings*) and *romantic partners* had on average the highest *essential* scores for all strategies than any other relational dyad (*parent-offspring M*=12; *partners M*=9; *offspring-parent* and *grandchild-grand-parent M*=6; *friends* and *siblings M*=5). Both of these dyad categories had low scores for all *unwanted* strategies (*friends*, *siblings* and *offspring-parent M*=4; *grandchild-grand-parent M*=3; *parent-offspring M*=2; *partners M*=1).

All strategies in all dyads were both *essential* and *unwanted* with a clear difference between the two

preferences. However, *Reciprocal Expressivity* was both *essential* and *unwanted* between *offsprings* in communication with *parents* (10 and 10) *siblings* (13 and 10) and between.

3.5.1 Top three essential strategies for:

Romantic partners found essential Reciprocal Expressivity (23), Joint Action (23) and Reciprocal Physicalness (19). Essential scores for other strategies were high as well with the smallest sore being 12. All unwanted scores were much lower than scores in corresponding essential strategies, with least wanted being Reciprocal Awareness (4) and Joint Action (3).

Friends found essential Joint Action (17), Reciprocal Memories (11) and Reciprocal Gift Giving (10). The top three unwanted strategies were Reciprocal Physicalness (16), Reciprocal Awareness (13) and Reciprocal Expressivity (8).

Siblings found essential Joint Action (18), Reciprocal Expressivity (13) and Reciprocal Memories (13). The top three unwanted strategies were Reciprocal Awareness (17), Reciprocal Physicalness (14), and Reciprocal Expressivity (10).

Parents, who wished to communicate with their offsprings in this way, found essential Reciprocal Memories (33) Reciprocal Expressivity (30) and Joint Action (30). Essential scores for other strategies were high as well with the smallest sore being 25. All unwanted scores were much lower than scores in corresponding essential strategies, with least wanted being Reciprocal Awareness (7) and Reciprocal Physicalness (6).

Offsprings, found essential Reciprocal Memories (15), Joint Action (13), Reciprocal Expressivity (10) and Reciprocal Gift Giving (10). The three top unwanted strategies were Reciprocal Awareness (16), Reciprocal Physicalness (11) and Reciprocal Expressivity (10).

Grandchildren, found essential wished to communicate with their grandparents in this way, were Reciprocal Memories (20), Joint Action (16) and Reciprocal Gift Giving (9). The top three unwanted strategies were Reciprocal Physicalness (13), Reciprocal Awareness (11) and Reciprocal Expressivity (9).

3.5.2 Types of Desired Augmented Keepsakes

As part of the open questions within the study, participants were invited to tell us what kind of special keepsake object they might want to use for communication with their loved-one. Participants in 216 dyads choose to share this information with us. Total of 224 artefacts were suggested that naturally fell into four categories: *wearable* artefacts (93), artefacts that provided physical and / or emotional *comfort* (50), *personalized mementos* that could be used or looked at (38), and artefacts that had a

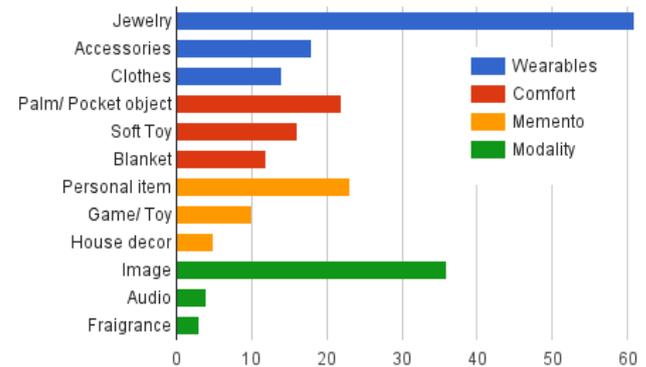particular *modality* that could be used a memory trigger (43) (Figure 10).

***Figure 10**: Proposed Augmented Keepsake Artefacts*

4. FINDINGS & IMPLICATIONS

Our study was designed to identify the characteristics of potential users of augmented artefacts that would allow for communication with loved-ones without having to write or talk. The study also examined users' preferences within specific types of relational dyads for six *strategies for mediation of intimate relationships through technology*, commonly used by HCI researchers (Hassenzahl at al., 2012).

4.1 User Characteristics

The present study identified the characteristics of potential users of augmented artefacts that allowed them to communicate with their loved-one without having to call or write. Using semi-structured online questionnaire, the study explored how the likelihood of using augmented artefacts was influences by the type of relationship, the gender of user and loved one, the quality of the relationship, and the frequency of contact with one's loved one. Participants were then asked open-ended questions about the qualities of potential artefacts they might want to use.

4.1.1 Relationship Type:

Participants in all types of relational dyads expressed a desire to use these kinds of artefacts; however, *romantic partners* and *offspring* were more likely to do so compared to other relational groups. Although *parents* were the most commonly reported type of relational figures, they were less missed than *romantic partners*. Interestingly, looking at *parent-offspring* and *offspring-parent* dyads, *parents* appear to be less missed by *offspring* than the other way around. The asymmetry was further evident in preferences for *mediation strategies* by both groups. It is possible that this imbalance is a bias resulted from the fact that we did not ask participants to indicate the age of their loved-ones. For example, the *offspring* that *parent*-participants referred to

could be very young, rather than grown-ups. On the other hand, this might be an interesting result that could be explored further to help *parents* feel more connected with their *offspring*. Future studies will need to take a closer look at the age of these dyads and the stage of their relationship, and attachment style in addition to relationship quality.

4.1.2 Gender

With respect to gender, users in pairs that included at least one female were more likely to want to use augmented artefacts for communication with their loved-ones than male-male pairs. Gender has not been considered in earlier literature, but might be beneficial for selection of relevant user-groups for future research.

4.1.3 Quality of the relationship

Users who reported better relationships were more likely to express a desire to use such artefacts. Future relationship-specific studies might find it useful to include measures of attachment security (Fraley, 2010), relationship stage (Knapp, 1978), and relationship quality, such as 'inclusion of other in the self' (Aron et al.,1992). Understanding attachment and psychological closeness in user-pairs will enhance our ability to improve users' wellbeing by providing appropriate mediation strategies.

4.1.4 Frequency of contact

Romantic partners reported to be in most frequent contact, it was also the most-missed category. In prior research, interaction within this group is generally approached from the perspective of long-distance relationships. However, in our study, participants who reported seeing their loved-one daily or a few times a week, were more inclined to want to use the augmented artefacts, compared to participants who saw their loved one less than once a month. This is consistent with *Relationship Psychology* which suggest that frequent and small acts of social support within intimate relationships are essential for thriving and wellbeing (Feeney & Collins, 2014). In this context, our findings provide an additional direction for research in mediation of relationships for loved-ones who see each other frequently.

4.1.5 Keepsake artefacts

Participants requested wearable artefacts that could provide emotional comfort, have a special sensory modality, and a special associated memory. Jewelry was the most common form of such artefacts, aligning with a long cultural tradition (Munn, 1993; Scarisbrick & Fenton, 2013) and creates interesting possibilities with developments in jewelry-like wearable technology (Silina & Haddadi, 2015).

4.2 Preferences of Mediation Strategies

4.2.1 Reciprocity

Our study examined six mediation strategies,

currently used by researchers in HCI (Hassenzahl at al., 2012) from the perspective of the users. The results indicated that although reciprocity is very important, one-way non-reciprocal strategies should also be accounted for. To reflect these, we propose a set of eleven *Expanded Mediation Strategies* (Table 3). The differences in reciprocity preferences could be due to the attachment styles of users. From the perspective of the *Attachment Theory*, secure adults are particularly good at the emotional give and take of close relationships. However, secure relationships only account to 60% of population (Mickelson et al., 1997), leaving 40% unstudied in the context of *Computer Mediated Communication*. These reasons could be tested in future targeted dyad-specific studies to help avoid anxiety and unnecessary emotion strain on non-secure users.

4.2.2 Preferences of strategies

Only a third of the users indicated that they found certain strategies *essential* for communication with particular loved-ones; with *Joint Action*, *Reciprocal Memories* and *Reciprocal Expressivity* being the top three most *essential*. Many indicated that they do not want certain strategies at all; with *Reciprocal Awareness*, *Reciprocal Physicalness* and *Reciprocal Expressivity* being the least wanted. Interestingly, *Reciprocal Expressivity* was almost equally *essential* and *unwanted* by *offsprings* and by *siblings*. It is possible that these are due to differences in attachment styles. But it is also possible that there are specific dynamics of communication within these two groups, as they both imply a history of relationships initiated in childhood (Feeney, 2006). It would be interesting to investigate these in the future targeted dyad-specific studies.

Joint Action was one of the top three essential strategies among all dyads. However, in earlier research this was one of the second least employed strategies (Figure 8). This difference could be because *Joint Action* requires synchronous communication and joint activities that might be difficult to achieve using keepsake-like artefacts. Participants made concrete suggestions of *Joint Action* artefacts (i.e., games) that could be explored in future research, with consideration to the role of *Joint Action* in specific types of relationships.

Reciprocal Awareness was one of the top three *unwanted* strategies by all dyads. However, in earlier research this was the most employed strategy (Figure 8). *Awareness* requires a high-level of self-disclosure and could also be linked to monitoring and infringing on the privacy of both user and loved-ones. A participant's request for complete awareness and self-disclosure from their partner

might reflect a preoccupied (insecure) attachment style. In this case, increased *Awareness* would not lead to increased wellbeing, relationship satisfaction and security. Which is why future studies should take into account the attachment styles and communication needs of both user and partner.

Overall, our findings suggest that users are inclined to prefer different *Expanded Mediation Strategies* in different types of relationships. The same mediation strategy might be considered *essential* in one context and decidedly *unwanted* in another. For example, *Reciprocal Physicalness* is one of the most *essential* strategies by *partners*, but one of the least wanted strategies in other types of relationships. As with earlier described user-preferences, these differences are important considerations for the design of the artefacts that mediate relationships between loved-ones.

4.3 Limitations

Our study, had several limitations. Despite using a mixture of closed and open-ended questions, it was mostly reliant on self-reports. In the future, an experimental manipulation of different types of *Expanded Mediation Strategies* applied to different types of relationships might provide results that are both more robust and specific for each type of dyad. It would be particularly interesting to test and deepen the findings of our study through the use of working artefacts that reflect the suggestions of our participants. It would be beneficial for these future studies to use a standard questionnaire for *Measuring Affective Benefits and Costs of Communication Technologies* (ABCCT) (Yarosh et al., 2014) to insure consistency between different types of artefacts and to allow researchers to compare future results of different studies.

Even though *attachment style* is an important underlying concept in communication patterns within the relationships, it was not practical to run a standard attachment questionnaire whilst looking at all the other variables. Despite this limitation, we can predict that people who are less likely to want certain types of mediation are more/less likely to exhibit certain attachment styles. For example, avoidant attachment would probably be associated with unwanted *Awareness To*, while anxious-ambivalent attachment would probably be associated with *essential* (desired) *Awareness From*. Future dyad-specific studies on mediation of relationships are needed and should include a measure of attachment, such as *standard ECR-R questionnaire* (Fraley, Waller & Brennan, 2000; Fraley, 2010) and a visual measure of the quality of relationship, such as *Inclusion of Other in the Self Scale* (Aron, Aron & Smollan,1992).

Similarly, the stage of the relationship is an important factor in communication patterns between loved-ones. For example, *partners* might want more *Expressivity* in the early stages of the relationship, and more *Memories* toward the maintenance stage. Nevertheless, it was not practical to include these variables into our study, and more targeted dyad-specific studies are needed. These should include *Knapp's model of Stages of the Relationship* (Knapp, 1978), and could be designed to look at the use of mediated artefacts designed for the maintenance of established relationships, or for remedying poor relationships, or advancing new relationships, etc.

5. CONCLUSION

Our study contributes to the part of the field of Computer Mediated Communication that is focused on artefacts designed to mediate the sense of relatedness through technology between loved-ones. In our paper, we expand this field, by adding perspectives of established theories from related disciplines. Drawing on research and literature from HCI, relationship psychology and communication sciences, the present study identified the characteristics of users and dyads that would want to use such augmented artefacts. These dyads tend to have at least one female, see each other more often than once a month, and report having a good relationship. The study also identified the need to expand currently used six *Strategies of Mediating Intimate Relationships though Technology* to account for non-reciprocal communication. It further identified that the *Expanded Mediation Strategies* are not equally essential and indeed not equally wanted. And that these preferences vary for the different types of relational pairs (friends, siblings, offspring-parent, etc.). The paper explored several theoretical and practical implications of the findings, suggesting further studies that will clarify the best uses of augmented artefacts in relationships, with the goal of improving users' wellbeing, reducing negative emotions, and increasing the sense of relatedness between loved-ones.

6. ACKNOWLEDGEMENTS

7. REFERENCES

Aron, A., Aron E. N. & Smollan, D. (1992) Inclusion of Other in the Self Scale & Structure of Interpersonal Closeness. *Journal of Personality & Social Psychology* 63 (45): 596–612.

Bartholomew, K. (1990) Avoidance of Intimacy: An Attachment Perspective. *Journal of Social and Personal Relationships*. vol. 7 no. 2 147-178.

Duck, S. (2007) *Human Relationships*. SAGE Publications Ltd; 4th edition

Feeney, B. C. & Collins, N. L. (2014) A New Look at Social Support: A Theoretical Perspective on Thriving Through Relationships. *Personality and Social Psychology Review.*

Feeney, J. A. (2006) Parental attachment and conflict behavior: Implications for offspring's attachment, loneliness, and relationship satisfaction. *Personal Relationships*. 13 (1): 1–134.

Fraley, C. R. (2002) Attachment Stability from Infancy to Adulthood: Meta-Analysis and Dynamic Modeling of Developmental Mechanisms. *Personality and Social Psychology Review.*

Fraley, C. R. (2010) A Brief Overview of Adult Attachment Theory and Research Background. University of Illinois, 1–8. http://internal.psychology.illinois.edu/~rcfraley/attachment.htm Retrieved 2016-09-19

Fraley, C. R., Waller, N. G. & Brennan, K. A. (2000) An item-response theory analysis of self-report measures of adult attachment. *Journal of Personality and Social Psychology*, *78*, 350-365.

Hassenzahl, M., Heidecker, S., Eckoldt, K., Diefenbach, S. and Hillmann. U. (2012) All You Need Is Love: Current Strategies of Mediating Intimate Relationships through Technology. *ACM Transactions on Computer-Human Interaction*, Vol.19, No.4.

Hazan, C. & Shaver, P. R. (1994) Attachment as an Organizational Framework for Research on Close Relationships. *Psychological Inquiry: An International Journal for the Advancement of Psychological Theory* 5 (1): 1–22. doi:10.1207/s15327965pli0501_1.

Knapp, M. L. (1978) *Social intercourse: from greeting to goodbye*. Boston: Allyn and Bacon.

Knapp, M. L. & Daly, J. A. (2011) *The SAGE Handbook of Interpersonal Communication*. 4th edition SAGE Publications.

Mickelson, K. D., Kessler, R. C. & Shaver, P. R. (1997) *Journal of Personality and Social Psychology*, Vol 73(5), 1092-1106. doi:10.1037/0022-3514.73.5.1092

Munn, G. C. (1993) *The Triumph of Love*. Thames & Hudson Ltd

Scarisbrick, D. & Fenton, J. (2013) *Rings: Jewelry of Power, Love and Loyalty*. Thames and Hudson Ltd

Sheldon K. M., Elliot, A. J., Kim, Y., & Kasser, T. (2001). What Is Satisfying About Satisfying Events? *Journal of Personality and Social Psychology* 80 (2): 325–39.

Silina, Y & Haddadi, H. (2015) 'New Directions in Jewelry': A Close Look at Emerging Trends & Developments in Jewelry-like Wearable Devices. In *ISWC '15 Proceedings of the 2015 ACM International Symposium on Wearable Computers*, 49.

Wright, K. B. & Webb, L. M. (2010) *Computer-Mediated Communication in Personal Relationships*. Peter Lang Publishing Inc

Yarosh, S., Markopoulos, P., and Abowd. A. D. (2014) Towards a Questionnaire for Measuring Affective Benefits and Costs of Communication Technologies. In: *CSCW '14 (ACM) - Proceedings of the 17th ACM Conference on Computer Supported Cooperative Work & Social Computing*. ACM, 84–96.