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Working with mediagrams: a methodology for collaborative research on mediational repertoires in multilingual families

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ABSTRACT

This paper contributes to current sociolinguistic research on the rapidly-changing landscape of digitally mediated communication (Androutsopoulos and Stæhr 2018) by presenting mediagrams, a new method for research on transnational mediated interaction. Based on an ethnographic study of mediated multilingual communication in four families with Senegalese-background living in Norway, we develop a visualisation scheme for the documentation and analysis of individual mediational repertoires. Starting with a review of visualisations used in relevant research and an outline of the context of our study, we present the production of mediagrams as a collaborative research process and their subsequent use in further data collection and analysis. Based on participants' language portraits, media maps, and self-selected excerpts of digital conversations, the collected data is coded and visualised in graphs that represent individual networks of interlocutors, language choices, language modalities, and media channels. Follow-up interviews lead to amended versions of mediagrams, which eventually form the basis for the analysis of individual mediational repertoires. In concluding we assess mediagram research as a contribution to citizen sociolinguistics (Svendsen 2018) and discuss blind spots of the method and its potential for wider application.

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Digitally mediated communication; polymedia; multilingual families; sociograms; mediagrams; collaborative research; visualisation

Introduction

This paper presents a method for the elicitation, visualisation and analysis of the interplay between language and media choices in transnational digital communication. Research across disciplines shows that digital media create new opportunities for transnational interpersonal communication. In media studies, Madianou (2014) suggests that the possibilities of transnational connectivity afforded by digital communication transform the entire experience of migration. Sociolinguistics and multilingualism research discuss digital media as a space where people can creatively draw on existing semiotic resources and acquire new ones (Blackledge and Creese 2017; Jørgensen et al. 2011; Lee 2017). The interplay of transnational mobility and digital communication is considered a driving force behind superdiversity (Androutsopoulos and Juffermans 2014; Blommaert and Rampton 2011). Research on multilingual families, too, is increasingly interested in how contexts of 'social media and technology saturation' (King and Lanza 2019, 2) may affect family language practices. Parents may facilitate their children's digital interaction in certain languages with specific interlocutors, and parents' influence on such involvement is considered crucial for children's heritage language development (Curdt-Christiansen and Lanza 2018). Digital communication also

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seems to play a role in counteracting language shift as it enables people to create spaces for heritage language practice and informal learning (Lanza and Lexander, Forthcoming; Reershemius 2017). At the same time, the choice of a media channel can in itself be meaningful to participants in mediated family communication (Madianou 2014).

In this paper, we address what we identify as a gap in this scholarship concerning the relation of language choice to the range of digital media that are available for transnational communication. While most research has examined language use online in a single media channel, the findings of our ethnographic fieldwork suggest that migrants draw on a number of digital channels for transnational communication thereby reflecting on the adequacy of particular channel choices for specific interlocutors.

Consider for instance the following observation: In the course of a day, 'Rama', a Senegalese-background female adolescent who lives with her family in Norway, uses several parts of her linguistic repertoire and several media channels to communicate with family and friends in Norway and elsewhere. During a phone call to her grandmother in Senegal, conducted in spoken Joola, Rama receives a Snapchat video, in spoken Norwegian, from her friends from school. Then she receives a voice message in Wolof from her cousin in France and a good-night message from her mother in Senegal, written in French and English.

Practices of this kind are common in the families researched in this project. To theorise them we pull together the notions of linguistic repertoire (Androutsopoulos 2014; Blommaert and Backus 2013; Busch 2012) and mediational means (Scollon 2001) to coin the notion of 'mediational repertoire'. A mediational repertoire can be thought of as a socially and individually structured configuration of semiotic and technological resources. Depending on the affordances (Bucher and Helmond 2017) of a given software application, a mediational repertoire comprises various modalities of language (speaking, writing, or signing), and various sets of pictographic and multimedia signs (e.g. emoji, memes, animated gifs, videos). Rama's repertoire comprises the languages she draws on to interact with her distant interlocutors, the choice between writing and speaking depending on each interlocutors' linguistic repertoire and the affordances of various software apps.

The aim of this paper is to outline a method for the elicitation and visualisation of such mediational repertoires. We call this method 'mediagram', a term coined by the second author in analogy to the familiar term, sociogram (see Section 'Introducing mediagrams'). A mediagram is a way of visualising a speaker's communicative choices at the level of language, linguistic modality, and media channel. Attempts to develop such visualisations are scarce, but in our view urgently pressing. This paper, therefore, responds to a methodological challenge in the study of multilingual communication in a digital era (Androutsopoulos and Stæhr 2018). We begin with a brief review of two sociolinguistic techniques for visualising linguistic repertoires, language portraits and transnational communication network graphs (Section 'Language portraits and communication networks: visualising linguistic repertoires'). After a brief introduction to our study of multilingual families (Section 'Research context: Senegalese families in Norway') we introduce mediagrams and explain their graphical make-up (Section 'Introducing mediagrams'). We discuss the collaborative process of compiling and using a mediagram through various stages of the research process (Section 'Creating mediagrams: a collaborative process'), then illustrate how mediagrams can be used to analyse language and media choices (Section 'Using mediagrams in data elicitation and analysis'). There follows a critical discussion of the method's opportunities and limitations (Section 'Visualising multilingual interaction: opportunities and limits'). We conclude by discussing the method's contribution to citizen sociolinguistics and its potential for further development as part of a blended ethnography of contemporary communication practices (Androutsopoulos and Stæhr 2018; Varis 2016).

Language portraits and communication networks: visualising linguistic repertoires

Sociolinguistic research on computer-mediated communication has investigated a wide range of multilingual practices online (see Lee 2017). The overwhelming majority of this research is based

on data from one specific channel, platform or communication mode, and linguistic choices of the same user(s) across various communication modes are hardly ever examined. This holds true for the rare visualisation of multilingual data from online social networks. For example, Paolillo (1999) visualises the distribution of sociolinguistic variables, including the use of Hindi, in an Internet Relay Chat channel named #india. His network analysis shows Hindi is preferred by the central group in this channel, which has the strongest in-group ties, whereas more peripheral user subgroups score low for Hindi. Androutsopoulos (2015) examines the choice of German, Greek and English in Facebook discussions among seven Greek-background classmates in Germany. The relation of language choice and interpersonal addressivity is visualised in a social network graph, which shows that bilingual exchanges are quite specific to a pair of female 'best friends'. Both studies use only data from one specific channel and offer no information on linguistic practices of the same users in other media channels.

We briefly review two techniques for the visualisation of multilingual repertoires we found useful in developing the mediagram. The first, language portraits, is part of an ethnographically grounded, language-biographical approach to multilingualism pioneered by Brigitta Busch (Busch 2012, 2013, 2017; Purkarthofer 2019). Busch's understanding of a linguistic repertoire focuses on how speakers associate certain linguistic resources with particular socio-biographical experiences and communicative spaces. As people's habitual linguistic choices are not necessarily conscious, bringing them to the fore is a methodological and analytical challenge (Busch 2017). Language portraits are a technique developed to this aim. The speakers are provided with a body silhouette and multicoloured pens and are asked to map the codes and languages that mean something in their lives. This yields two sets of data, the visualisation itself and a narrative that is 'elicited by the image' (Busch 2012, 518). Busch argues this narrative enables speakers to articulate what meaning they 'attach to their linguistic resources, their language practices, and their language attitudes in particular, and what significant lived experiences underpin these constructs of meaning' (Busch 2012, 518–519). As discussed below (Section 'Creating mediagrams: a collaborative process'), we used language portraits in our initial interviews with family members to introduce questions of language use and to prelude the collaborative drawing of media maps, which provide raw data for mediagrams.

Two recent attempts to visualise the interplay of language and media choices in individual communication networks are Brandehof (2014) and Nemcová (2016). Both are couched in language and superdiversity research and aim 'to unravel the social structure of superdiverse diaspora networks through analysing sociolinguistic repertoires' (Brandehof 2014, 28). Brandehof's study of Cameroonian migrants in Belgium draws on interviews and ethnographic observation to visualise linguistic and media choices towards various interlocutors and to various purposes. The graph in Figure 1 shows the communication network of one person, Amadou. His interlocutors are represented in terms of kinship and social relationships (e.g. 'daughter', 'Belgians') and arranged by geographical location (Cameroon, Gent). Each interlocutor is connected to two nodes, one for media choices (e.g. 'text messages', 'calls') and one for languages (e.g. 'Pidgin', 'Dutch'). The graph includes language and media choices tied to certain purposes rather than interlocutors (e.g. 'Searching for jobs'). Colour-coding is used to distinguish interlocutors, locations and languages. Nemcová (2016), too, draws on interview data to visualise the personal networks of three students with different geographical and migrant background who study in the Netherlands and in China. In the example given in Figure 2, the informant's interlocutors are grouped together by geographical location (Netherlands, Russia), in part subdivided by region or city (Eindhoven, Tilburg). Icons are used to represent languages and media applications. Domains of communication are placed in boxes and frequency of contact is indicated by colour-coding.[1]

Language portraits and network graphs offered inspiration to the method presented here (see also Hepp, Roitsch, and Berg 2016 for a similar procedure from communication studies). Mediagrams resemble language portraits and communication graphs in that they visualise one individual's language choices to relevant partners rather than representing the distribution of linguistic features across an entire social network. Mediagrams differ to language portraits not only in the obvious sense

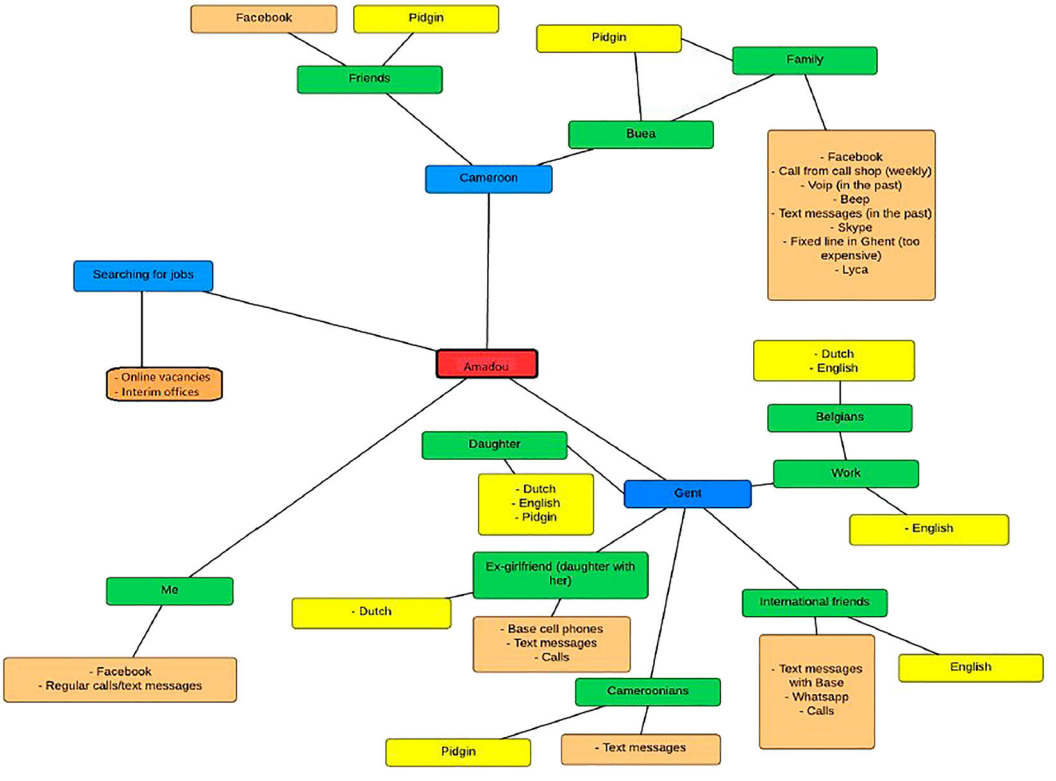

Figure 1. Communication network of Amadou (Brandehof 2014, 35).

of including distinct modalities of language and media choices but also by representing meditational choices directed to specific interlocutors. Mediagrams differ to multilingual network graphs in that they are based not only on interview data and ethnographic observation but also on samples of digital interaction. More details are discussed in Section 'Introducing mediagrams'.

Research context: Senegalese families in Norway

The method presented in this paper was developed in an ethnographic project on mediated multilingual practices among Senegalese-background families in Norway. The project's main aim is to understand relations between the family members' multilingual repertoires, their digital interaction partners, and the various media they use to communicate with them. The project also examines implications of mediated communication for heritage language use and practices of mode switching, i.e. alternation between writing and speaking in media such as WhatsApp. Its scope is thus broader than much research on family multilingualism (e.g. Curdt-Christiansen and Lanza 2018). The visualisation method presented in this paper is one way of establishing a connection from single interactional episodes to the broader context of digitally mediated communication in a family context, thereby taking into consideration different generations, geographical locations of interlocutors, and communication strategies. We focus on the linguistic and media choices by various family members towards a range of interlocutors (members of the nuclear family in Norway, relatives and close friends, in Senegal and elsewhere), thereby paying close attention to the diverse language experiences of individual speakers, given that 'bilingualism and multilingualism mean different things to different generations and to different individuals within the same family' (Hua and Wei 2016, 656).

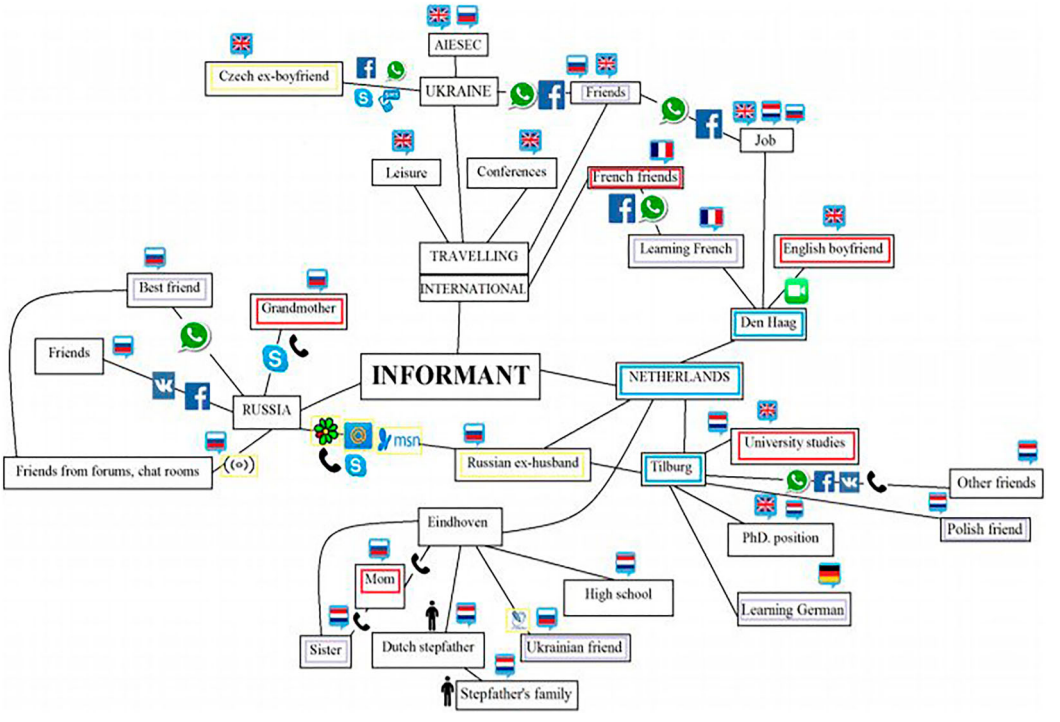

Figure 2. Visual representation of Nadya's network (Nemcová 2016, 20).

Four families were recruited to the study. As the aim is to look at language use in different types of relationship within transnational families with diverse linguistic repertoires, these families differ with regards to their background and composition.[2]

- Family 1: two parents born in Senegal, son (16 years old) born in Senegal, daughter (10 y.o.) and son (6 y.o.) born in Norway
- Family 2: mother born in Norway, father born in Senegal, two children (5 and 8 y.o.) born in Norway
- Family 3: father and daughter (14 y.o.) born in Senegal
- Family 4: mother with four children, two born in Senegal (20 and 19 y.o.), two born in Norway (16 and 10 y.o.)

We followed the families over two years, collecting three different sets of data, introduced here in brief and further described below. The first data set consists of ethnographic interviews, some with individual participants, others among two or more family members, and focus groups. These interviews involve various means of visual support, including language portraits, media maps (discussed below) and media diaries. The second data set comprises excerpts from the interviewee's digital interactions, such as text and voice messages, message threads, photos and videos. These are collected through downloads, screenshots or photos and are discussed in the interviews. Field notes from the observation of natural communication in the family home make up the third data set. These data form the backdrop for ethnographic triangulation in the sense of digital ethnography (Androutsopoulos 2008; Varis 2016). As the following discussion illustrates, mediagrams are contextualised within this procedure. Their compilation relies on interview reports and textual data participants decide to share with us (Section 'Creating mediagrams: a collaborative process'). Once a

mediagram is composed, it may be used in follow-up interviews for verification and to elicit more data (Section 'Using mediagrams in data elicitation and analysis').

Introducing mediagrams

Mediagrams are visual representations of patterns of language, modality, and media choices in family communication. The idea and the term are inspired by sociograms, a key method for the visualisation of social network data (see e.g. Huang, Hong, and Eades 2006), which has been widely received in sociolinguistics and adapted for the study of linguistic variation and change (Milroy 1980; Sharma 2017). The design of mediagrams orients to sociograms for ego (or personal) networks, which represent social relationships between a core informant (*ego*) and relevant partners (*alters*). We adopt the circular layout and the 'ego star' graphic pattern that is common in sociograms in sociolinguistics scholarship (Sharma 2017). Differences of mediagram design from other sociolinguistic applications concern the kind of represented information and the graphic modalities deployed. Shapes, layout, and colour are deployed to represent different languages, language modalities, and mediational tools, the making of the graphs thereby relying on subjective (interview reports) as well as objective data (excerpts of digital interaction). Similar to the use of sociograms in social-scientific research, mediagrams are a graphical representation of qualitative data aimed at making patterns visible and at presenting information during the data-gathering process (Drahota and Dewey 2008; Hogan, Carrasco, and Wellman 2007; Tubaro, Casilli, and Mounier 2014).

Figure 3 shows the mediagram of one participant, the daughter of family 3 (D3). It depicts her language, modality and media choices for interaction with nuclear family members, close friends in Norway, and extended family members in Senegal and France.

Mediagrams use colours to distinguish languages and line style to represent language modality. This graph features Norwegian (red), Wolof (green), Joola (light green), French (blue), and English (black). A continuous line indicates written, a dotted line spoken language use, and a mixed-type line is for the use of both modalities. In such cases, a participant reports that communication with a certain distant interlocutor involves both speaking (e.g. phone calls, voice messages) and writing (text messaging). For example, D3 reports that she communicates with her mother in Joola, Wolof and French, both in written and spoken mode, as well as in English for text messaging. In some cases, modality and language choice are more restricted for a given pair of interlocutors. D3 communicates

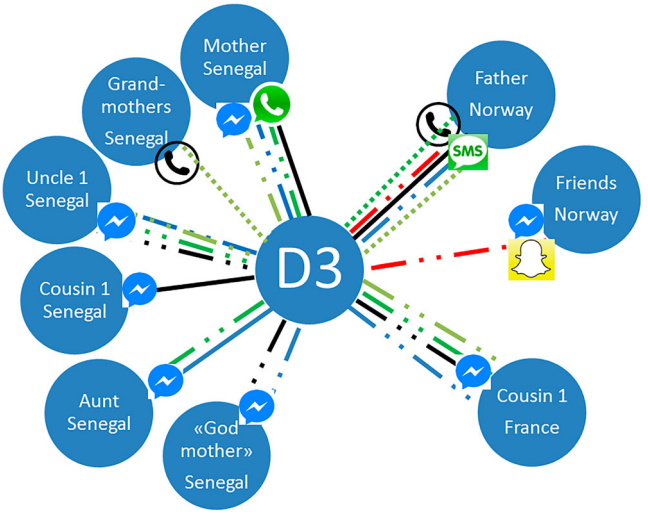

Figure 3. Mediagram of the daughter in family 3 (D3).

with her grandmothers in Senegal only via phone calls in spoken Joola. Media channel choices for each interlocutor are represented with distinctive icons next to each interlocutor circle. D3 uses Facebook messenger to most of her interlocutors, WhatsApp to her mother in Senegal, and Snapchat (yellow square with white symbol) to her closest friends in Norway.

The visual structure of mediagrams differs in several respects to the network graphs by Brandehof (2014) and Nemcová (2016). Mediagrams do not represent communication purposes such as travelling or searching for jobs but focus on language and media choices for interaction with specific interlocutors. Mediagrams explicitly represent the choice of language modality, an aspect we found analytically and theoretically important.[3] However, mediagrams differ from Nemcová's graphs in that they do not encode the frequency of contact between interlocutors, an issue we take up in the concluding discussion (Section 'Visualising multilingual interaction: opportunities and limits').

Creating mediagrams: a collaborative process

The creative process that leads up to a mediagram is a collaborative endeavour that starts at the first meeting with participants and continues throughout the data collection phase. We outline this process here and discuss its contribution to citizen sociolinguistics later (Section 'Conclusions').

In the first interview, the participants draw language portraits to talk about their linguistic repertoires. One such portrait is by the oldest son in family 1 (Figure 4).

The portrait presents a young man with lines going from the head to bubbles with various language labels: *Wolof, Fransk* (French), *Sleng* (slang), *Engelsk* (English), *Norsk bokmål/nynorsk* (Norwegian Bokmål and New Norwegian, Norway's two official written languages, both taught in high school). Commenting on the drawing, S1.1 says, 'I have drawn a guy who is a little confused, because he has kind of, he is supposed to know so many languages, so he may mix' (translated from Norwegian). He says he knows all of these languages and needs to learn more, but that it is difficult because there is *så my språk*, 'so much language', in his mind. He says he uses Norwegian and 'slang' with friends, and Norwegian as well as English and French in school. He links French to relatives in

Figure 4. Language portrait made by the oldest son in family 1 (S1.1).

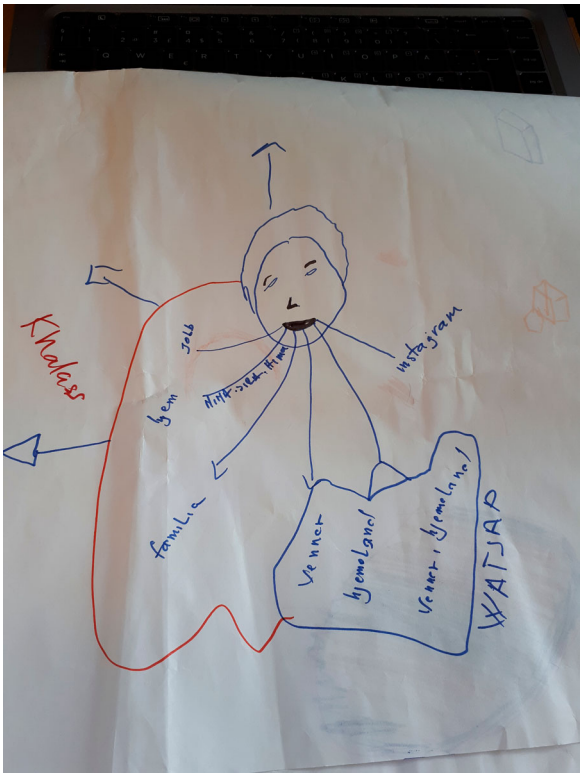

Figure 5. Hand-drawn media map by the father in family 2 (F2).

Senegal and Gabon with whom he uses this language on WhatsApp and Viber. Hence it is S1.1 himself who shifts attention to digital communication, indicating its importance for his language choices.

Following the portrait-drawing activity, participants are invited to visualise their mediated communication by starting from a circle that represents themselves. They can draw lines to relevant interlocutors, use colours to represent languages, and inscribe media choices into the drawing. Figure 5 shows a media map drawn by the father in family 2.

The participants are free to draw their media map as they like. Some draw themselves, others prefer to let the researcher make the drawing while providing information they want to see included. In this case, F2 presents his mediated communication as coming out of his mouth and head. He draws a red line to encapsulate his interlocutors and activities to the left of the head. Closest to his mouth, the names of his wife and two children are lined-up along a vector that starts from the mouth. A bit further to the left come more vectors with the items *job* ('work'), *hjem* ('home'), the latter on the same vector with family members, and *familia* – we do not know why he chose this Italian-sounding variant of the word. To the left of the red line, delimited from the family space, is the Wolof name of a radio show, *Khalass*, written down by the researcher to represent information provided by F2 in the course of the drawing. To the right, three more vectors connect the figure's mouth to certain social spaces and media apps. The items *venner* ('friends') and *hjemland* ('homeland') are framed with a blue line, followed to the right by the word *WhatsApp* (in capitals), while *Instagram* stands somewhat separated.

Hand-made media maps of this kind provide a focal point of attention for the interview and a point of departure for collecting digital data. During the interview, media maps work pretty much like language portraits in that they capitalise on the affordances of visualisation to prompt metalinguistic reflexivity (Busch 2013, 36ff.). The mere process of drawing, Busch argues, creates

opportunities to stop, reflect and distance oneself from one's own linguistic (and, here, mediational) practices. Visual representation is a mode of meaning-making in itself, in that visual resources (e.g. layout, colour) can be meaningfully deployed in indexing the value of a particular resource relative to other resources. The visual figure becomes a reference point for the rest of the narrative interview. It elicits and organises the narrative, for example by enabling the participant to take up shapes and colours as an occasion for sharing language-biographical and techno-biographical details (Barton and Lee 2013). Media maps and mediagrams also provide a point of reference that may help anchor participants' attention and keep them focussed on the topic of discussion. This is consonant with research with participant-generated sociograms (Hogan, Carrasco, and Wellman 2007; Tubaro, Casilli, and Mounier 2014), which points out the advantages of including a visual depiction of an informant's social network into the data-gathering process. In our experience, this proves particularly useful when the interview takes place in the family home amidst constant interruptions such as ringing doorbells and children asking for help. Mediagrams also provide an anchoring point that might help other family members to join the discussion.

Excerpts of digital data can be collected on the spot to contribute to the first version of a mediagram. The researcher requests samples of the informant's mediated interaction with interlocutors who are represented on the drawing and asks the informant to clarify with the respective interlocutor whether the data may be used for research purposes. The informants themselves define boundaries of 'shareability' by deciding which parts of which interaction threads to disclose and how to share them, e.g. by means of a download, screenshot, or photo. The participants thus actively take part in the collection of interactional data. All data is coded in a calculation sheet, which is the source for the compilation of a mediagram. For example, the mediagram of participant F2 (Figure 6) is based on information collected in the interview and WhatsApp threads he shared with us.

Besides his wife and children in Norway, Father 2 communicates with his mother, sisters and brothers in Senegal, friends in Senegal and Italy. He is a member of two religious group-chats, one Norway-based and one Senegal-based, and also participates in a family-chat with cousins and

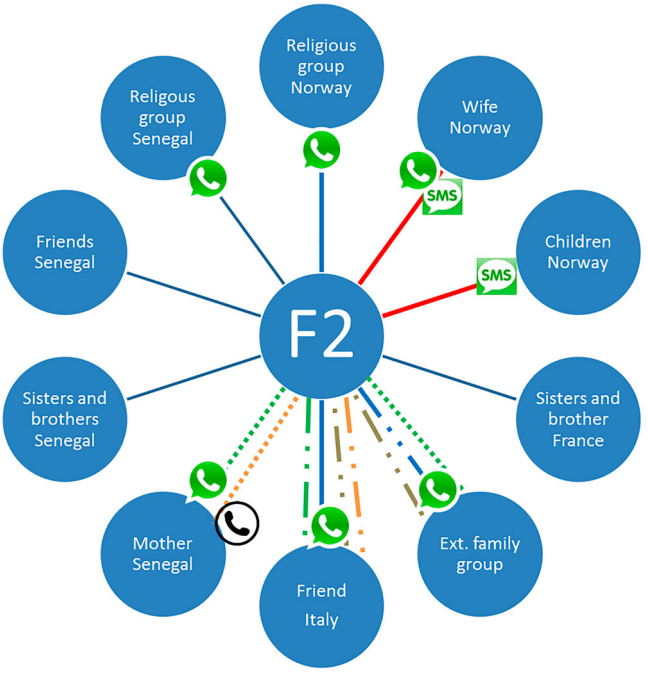

Figure 6. Mediagram of the father in family 2 (F2).

less close relatives. His preferred media are WhatsApp, SMS, and phone calls. With his mother he speaks Fula and Wolof on the phone and via WhatsApp, while his interaction with the extended family group and his friend in Italy draws on up to four different languages.

At this stage, the mediagram for F2 is unfinished. All interlocutors he mentioned during the map-drawing task are included, but his own language and media choices are incomplete. During the interview, F2 provided excerpts of mediated interaction with his mother (WhatsApp voice messages in Fula and Wolof), his nuclear family (SMS and WhatsApp in Norwegian), his friend in Italy (written and spoken WhatsApp messages in different languages), and a WhatsApp group of his extended family (spoken Wolof, spoken and written French and Arabic). However, there is no data on his language and media choices towards friends and siblings in Senegal and France and in two religious WhatsApp groups he is part of. These missing bits are identified while compiling the mediagram and discussed at the next meeting.

Missing bits and contradictions that may come up during the compilation of a participant's mediagram are discussed at the follow-up meeting, where the mediagram is presented to the participant who is then invited to reflect on it (see also Nemcová 2016). The participant is also invited to comment on excerpts of digital interaction that were selected during the compilation process (see Androutsopoulos 2008). The new information obtained in the follow-up interview is integrated into the calculation sheet, and the mediagram is modified accordingly.

This procedure can be repeated if the time available for fieldwork allows for it, potentially leading to iterative additions to the data collection and improvements of the respective mediagram. This way, on-going changes in the mediational practices of a participant can be captured. Figure 7 summarises the collaborative process of mediagram compilation and use in six steps.

At Step 1, participants draw maps in the interview setting and comment on them. At Step 2, textual data is collected. At Step 3, the data for each participant is organised in a calculation sheet with codes for language, modality, media channel, etc. This calculation sheet serves as basis for compiling the mediagram (Step 4), thereby taking note of unclarities and/or interesting interactions that the researcher would like to explore further. The mediagram is presented to the participant at the next data collection session (Step 5), where questions are discussed and new digital data that exemplify specific relationships represented in the graph are collected. This new data is used to modify the mediagram, which can be taken back to the participant again at the next meeting. This cycle of data collection, visualisation, ratification, and optimisation can in principle be repeated as many times as the fieldwork limits allow for. At the end of the cycle (Step 6), a mediagram can be used for analysis.

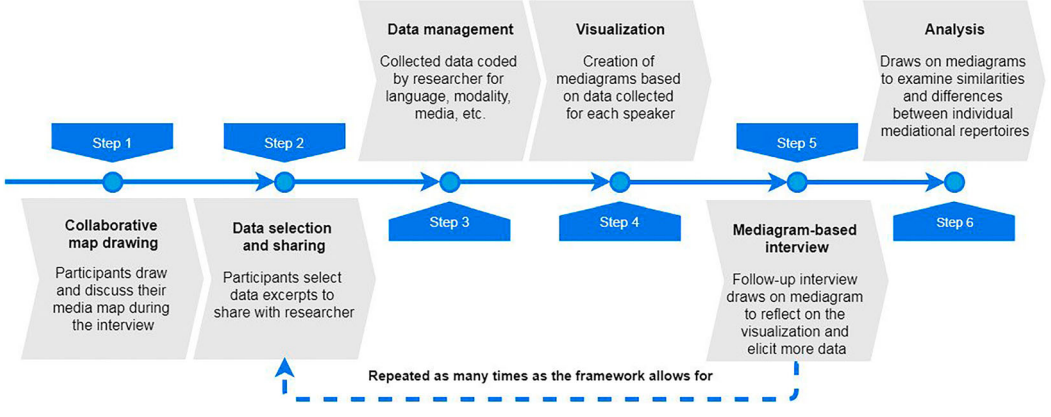

Figure 7. The mediagram research process step by step.

Using mediagrams in data elicitation and analysis

Once re-inserted in a new interview situation (i.e. Step 5), a mediagram is jointly examined by the participant and the researcher in order to be ratified, corrected, or complemented. We illustrate this with an example from the second meeting with family 1, where the first author presents the mediagrams she compiled for each family member. In excerpt 1, the researcher (K) presents the oldest son in the family (S1.1) the first version of his mediagram (see Figure 8) and asks for more information about his interaction with his maternal uncle, a new interlocutor that S1.1 has introduced during the interview. S1.1 talks about their media and language choices, then explains that his father often mediates his interaction with the uncle.

Excerpt 1: Discussing the mediagram of Son 1.1 (S1.1)

K	Hvordan snakker du med han, da? 'How do you talk with him then?'
S1.1	Det er wolof 'It's Wolof'
K	Det er wolof, og da snakker du, eller skriver du, eller? 'It's Wolof, and then you talk or do you write?'
S1.1	Da er det ofte Skype, ja 'Then it's often Skype, yes'
K	Skype? Ja 'Skype? Yes'
S1.1	Ja, det er pappa som dem snakker, så kanskje e kjem inn, si hei og snakke med dem, så 'It's dad who talks and then I may come in, to say hi and talk to them, so'

The first version of S1.1's mediagram is based on the media map he drew at our first meeting and on SMS messages he shared with us. After the second meeting, his mediagram was extended to include additional relatives from Senegal and more smartphone apps (Figure 9). These additions were based both on the interview and on excerpts of digital interaction that S1.1 shared with us. In other cases, such data can confirm information obtained in the interview, e.g. regarding the exclusive use of Norwegian in text messages between S1.1 and his parents. Excerpts from digital interaction can thus lead to changes in the display of language, modality or media choices in a mediagram.

Working together with a participant to identify missing data and possible oversights by the researcher run smoother when reference is made to a visual depiction. Mediagrams can also be

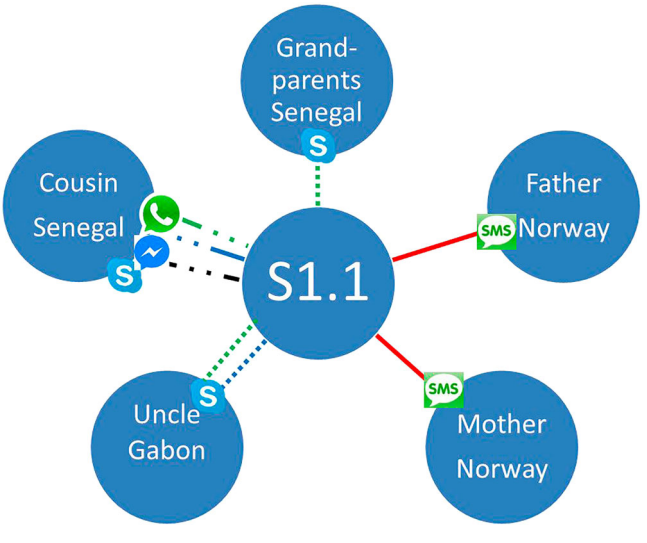

Figure 8. Mediagram of the oldest son in family 1 (S1.1) compiled after first meeting.

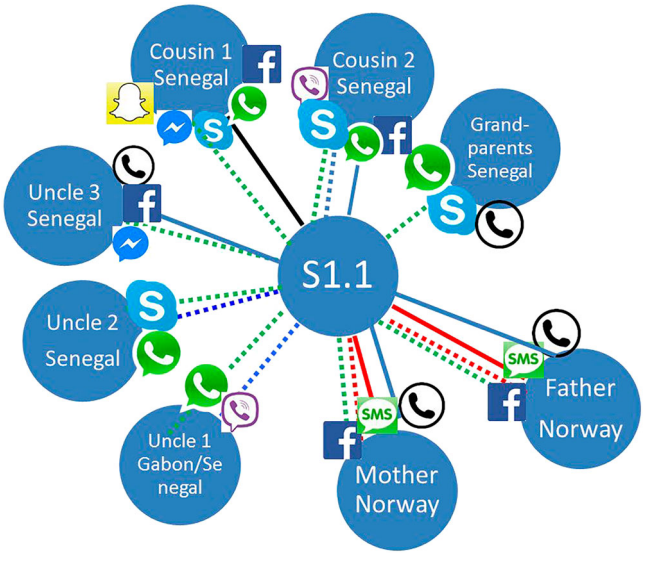

Figure 9. Mediagram of the oldest son in family 1 (S1.1) compiled after second meeting.

used to discuss the frequency of interpersonal contact and elicit details on the selection of languages and media applications. For example, the daughter of family 3 (D3) explained in the follow-up meeting how the choice of media channel helps her arrange her social network into groups. She uses Facebook messenger with what she calls 'the children of the adults in the family', whereas WhatsApp is her channel of choice for her closest relatives. With friends from school in Norway, she prefers Snapchat. This participant articulates her repertoire of mediational tools with her social contacts, and in this process certain choices from the linguistic repertoire can become associated with certain apps, e.g. Norwegian is preferred for Snapchat, but English and Wolof predominate in WhatsApp.

Once compiled, mediagrams enable the comparative analysis of mediational repertoires. We exemplify this with a comparison of the fathers in families 1 and 3 (F1 and F3). The mediagram for F1 (Figure 10) shows he prefers to write in French and talk in Wolof with his brothers in Senegal. However, F1's exchanges with his female cousin in Senegal (lower left part) and his sister in Canada (bottom, middle) also include some written Wolof. A WhatsApp thread and a Facebook messenger conversation that F1 shared with us suggest that he and his cousin often use written Wolof in teasing each other, a finding that echoes patterns on multilingual texting in Senegal (Lexander 2011). F1's cousin is also the wife of one of his brothers, i.e. his sister-in-law. The playful content of these exchanges is in fact consonant with traditional expectations to an in-law and cousin-to-cousin relationship (cf. Diop 1985). However, F1 rarely writes Wolof to his sister, even though she does write Wolof to him. His writing in Wolof is thus asymmetrically distributed to these two interlocutors. This example illustrates the limitations of the visual representation offered by mediagrams and the need to contextualise the graphs in qualitative analysis.

The mediagram of the father in family 3 (Figure 11) displays diverse language choices towards different interlocutors. With his mother and his siblings, F3 communicates only in spoken Joola. With his daughter, he uses a number of languages in speech, but only Norwegian in written interaction. His communication with the daughter's mother who lives in Senegal is also multilingual, but only written. F3 has various business projects in Senegal, which he coordinates from Norway. He writes business email messages in French, while his business phone calls come in Joola. This distribution of languages to modalities reflects the diglossic structure of Senegal, where literacy is traditionally tied to the ex-colonial language, French (Lexander 2011). With his Senegalese friend in Norway, F3 uses Norwegian alongside two Senegalese languages, Wolof and Joola, in speaking

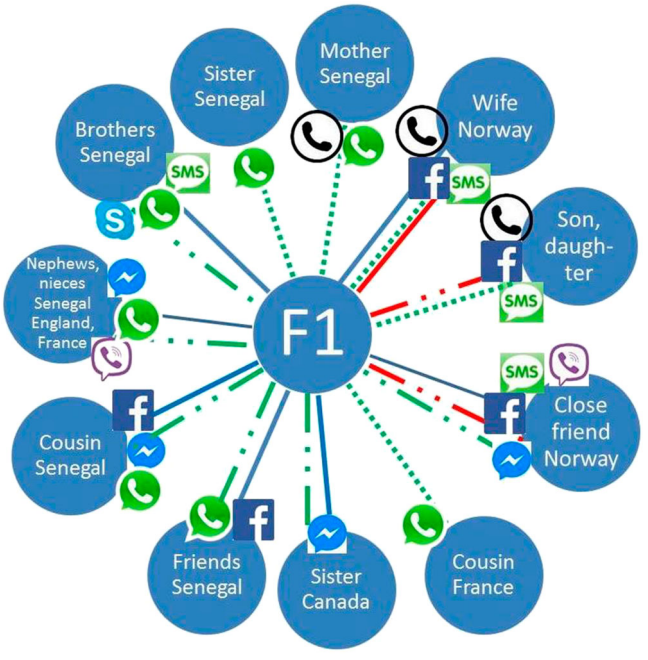

Figure 10. Mediagram of the father in family 1 (F1).

and writing. The comparison suggests that F3 is able and willing to draw on these different languages in his distant digital communication with family, friends and project partners, thereby making socially meaningful choices, e.g. for business emails as opposed to family phone calls. F3 is a vivid example for the kaleidoscopic structure of languages, modalities and media channels, which are co-selected according to interlocutor and communicative purpose. His language choices differ from those of F1, and this is in part due to the fact that coming from the south of Senegal, F3

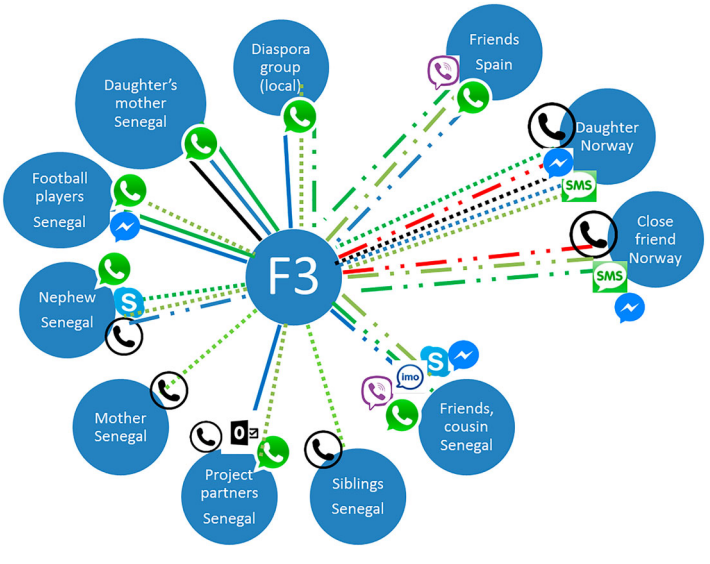

Figure 11. Mediagram of the father in family 3 (F3).

can draw on a wider range of languages from his repertoire than F1, who comes from a Wolof-speaking family and a Wolof-dominant city.

Mediagram analysis does not work in isolation but draws on contextual information collected in the fieldwork. Mediagrams themselves cannot reveal the different factors that shape speakers' mediational choices. These must be disclosed in interviews around the graphs. For example, the graph for D3 (see Figure 3) indicates the use of spoken Joola on the phone for communication with her grandmothers. However, details are only disclosed in a joint interview with father and daughter in family 3, where D3 reports that her grandmother from Senegal presses her to use spoken Joola by refusing to reply when D3 talks to her in Wolof. Moreover, each version of a mediagram provides insight into a person's mediational repertoire at a specific point in time. A sequence of mediagram versions may therefore reveal changes in a mediational repertoire. For example, the mother in family 1 (M1) complained at our first two meetings that her sisters in Senegal did not use the Internet, making distant interaction quite difficult. A regular phone call was the only available mode, the sisters depended on phone-cards for these calls, and conflicts could arise in case of insufficient credit. By our third meeting, both of M1's sisters had started using WhatsApp, thus making their exchanges more frequent and less dependent on financial limitations.

Visualising multilingual interaction: opportunities and limits

Mediagrams present certain representational shortcomings at their current stage of development, which we critically discuss here with a focus on opportunities and limits of visualisation and its theoretical implications. In their current format mediagrams do not represent the frequency of interaction and the directionality of language and modality choices between interlocutors. Unlike Nemcová's (2016) network graphs, mediagrams do not represent the frequency of contact between two interlocutors. Even though this is discussed in the interviews and can to a certain extent be read off the textual data participants share with us, we found it difficult to measure it consistently due to its instability over time. For example, the oldest son in family 1 (S1.1) had daily contact with his cousins in Senegal for a long period, which slowed down as S1.1 became occupied by other activities in Norway. In the approach developed here, such variation is not represented visually but dealt with in qualitative analysis.

Regarding language and modality choice, a mediagram visualises the language modalities selected for interaction with a certain interlocutor but does not distinguish their directionality between interlocutors. This becomes an issue when the choice of language modality is asymmetrical. For example, the youngest daughter in family 4 (D4.2) is not comfortable with speaking Wolof and prefers to write it, even when she receives voice messages in Wolof. Her mediagram indicates that her communication with a particular relative is both spoken and written in Wolof, but does not indicate that D4.2 produces all written Wolof in their exchanges, while all spoken Wolof comes from her relative. This information could be added to the mediagram, though on the cost of added graphic complexity.

A representational issue with wider theoretical implications is the visualisation of multilingual interaction. Our textual data suggest that translanguaging practices of various kinds predominate in many mediated interactions. Some interactions echo multilingual interaction patterns attested for spoken communication in Senegal, where Wolof, French and regional languages are part of many speakers' multilingual repertoire (Dreyfus and Juillard 2004). Younger informants also draw on English and Norwegian, while members of religious group-chats draw on Arabic as well. Echoing findings from research on metrolingual practices (Pennycook and Otsuji 2015), we see this fluidity coming up even with single linguistic features. For example, the mediagram for participant F2 (Figure 6) indicates his communication with his mother in Senegal is in spoken Wolof and Fula. However, F2's mother frequently introduces her Fula voice-messages with the French opening *Allô* ('Hello'). Here the question comes up whether to assign *Allô* to French or Fula (perhaps mediated through Wolof), which goes to show that a lexical item's etymological or genetic origin does not forcibly match a speaker's metalinguistic awareness (cf. Jørgensen et al. 2011; Pennycook

and Otsuji 2015) Were we to assign *Allô* to French, a dotted blue line for 'spoken French' could be added to F2's mediagram, though with the effect of making this linguistic choice appear as important as spoken Fula, which is simply not accurate for F2 and his mother.

Mediagrams reduce the complexity of multilingual practice to a visual representation of distinct languages by distinct coloured lines. This colour-coding could be criticised as an idealised representation of language use, whereby one language is apparently used at a time. It even seems to reinforce an underlying theoretical understanding of languages as bound entities that can be categorically separated from each other. Such an understanding, which is sharply criticised in recent discussions of translanguaging and metrolingual practices (Garcìa and Wei 2014; Pennycook and Otsuji 2016), is neither endorsed by the authors of this paper nor does it reflect the informants' language awareness. For example, the father in family 3 explained he had never thought of his language practices as made up of different languages until he participated in this project. While discussing the first version of their mediagrams, we asked the members of family 3 what languages they use together. D3 said *alle* ('all'), her father said, *vi tar litt av hvert* ('we take a little here and a little there'). This is visualised in the mediagrams (Figures 3 and 11) by five different colours, once again transforming what participants articulate in a rather fluid manner into distinct representational units.

Is it at all possible to visually represent all fluidity and complexity of multilingual practice in a graph? Our answer to this is negative. It is certainly possible to optimise the graphic design of mediagrams, and some shortcomings could be amended through visual effects such as the mixing of colours, additional variation in line styles and size, merging or braiding language-specific lines. However, this might increase the complexity of mediagrams at the expense of readability. But the issue is not so much a technical challenge rather than the limits imposed by the graph itself. It is part of the medium's visual logic that fluid language practices, which comprise an alternation between different language styles and genres, *must be* reduced to a particular language and modality choice to be visualised. In this sense, we consider the graphic separation of distinct languages a 'necessary evil', which neither reflects the metalinguistic awareness of some of our participants nor our own theoretical and methodological positioning. It is a representational shortcoming that mediagrams share with other similar visual representations. And it is precisely for this reason that mediagram analysis engages the participants themselves and draws on fragments of their mediated interaction in order to contextualise the visual representation.

Conclusions

A mediagram is a method for eliciting and visualising the co-patterning of language, modality and media choices in an individual's mediated communicative practices. This paper discusses how mediagrams can be compiled and used for data elicitation and analysis. Being part of a digital ethnography approach, mediagrams are not conceived of as a stand-alone tool. They represent both an outcome of information elicited in interviews (and digital data) and an input into a subsequent exchange between participant and researcher, which may result in a mediagram being verified, modified, or contextualised.

As a visual representation, mediagrams have a dual function. First, they may help the analyst identify at a glance similarities and differences across individual mediational practices. In this regard, their advantage over the textual and numerical data on which they rely is conciseness and practicality. Second, mediagrams are a resource that facilitates the data-collection process itself by providing an anchor of joint attention for collaborative reflexion. Mediagrams offer various opportunities for comparative analysis with regard to the mediational repertoires of individuals, families and generations, their changes in time, the social meaning of particular media choices, and implications for heritage language maintenance. The mediagrams presented here are compiled manually, and opportunities for automated computerised compilation remain to be explored.

The method outlined in this paper is consonant with principles and aims of citizen science, i.e. 'the engagement of non-professionals in conducting scientific research in collaboration with

professional scientists or research institutions' (Rymes and Leone 2014; Svendsen 2018, 138). A part of citizen science, citizen sociolinguistics, 'includes non-professionals in *doing* sociolinguistic research, in collecting data, in registering them, analysing and interpreting them' (Svendsen 2018, 141, author's emphasis). As our discussion suggests, mediagrams constitute both a visualisation of findings and a communication of these findings to informants. In the course of the research, the participants have a say in selecting information they disclose (Step 1), in the compilation of digital data (Step 2), and in the feedback they offer on the different versions of their mediagram (Step 5). The mediagram method is also consonant with citizen sociolinguistics in its potential to increase sociolinguistic awareness. This became evident with some of our participants when the difference between what speakers say they do and what they actually do became a topic of reflection for the participants themselves during our meeting. Not least, mediagrams represent an accessible research outcome. For example, when D4.1 first saw her mediagram she took a photo of it. This is a material result of what she contributed to the study, which she can readily understand and use as she likes. This way, participants may develop a feeling of ownership to the project.

From a critical angle, we point out that mediagrams have limits in what they can visually represent. Their present version features representational shortcomings, which could potentially be amended in later, technically refined, versions. Like language portraits or sociograms, mediagrams require interpretation. We therefore do not expect a mediagram itself to capture the fluidity and subtlety of semiotic choices in transnational mediated interaction. Rather, this is done in qualitative analysis in which the information represented in mediagrams and available interaction fragments are reciprocally contextualised. Mediagrams aim to represent regularity rather than singularity, and fixity rather than fluidity (cf. Pennycook and Otsuji 2016, 274). As various examples in this paper illustrate, people do use language labels to discuss their language practices. We therefore argue it is possible for researchers to use language labels with participants and nonetheless signal they do not think of languages as bound entities. The colours, line styles and icons that make up a mediagram represent mediational resources that a speaker uses (or reports using) on a regular basis. Mediagrams do not capture unique instances and unusual choices of languages or media, but rather repeated, perhaps routinised choices for the conduct of mediated interaction with specific interlocutors, and thereby set up a background against which analysis may reveal nuances and situated exceptions.

Notes

1. A red frame signifies communication with an interlocutor (or a group) takes place at least once a week, a purple frame indicates less frequent contact, and a yellow frame indicates communication no longer takes place.
2. All ages at the start of fieldwork in 2017.
3. Language modality is often implicitly inferred from media choices, but not always so. Indeed, WhatsApp and Skype enable both speaking and writing.

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