Coping with crowdedness in mass transportation

The role of emotions in the Paris metro

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Riding overcrowded metros, tubes or subways with dozens of strangers in varying moods is routinely viewed as a trying experience. Yet we know very little about the discreet but crucial emotional work that passengers do every day in order to facilitate the smooth functioning of urban mass transportation.

In Paris, annual metro ridership increased from 1.2 billion journeys in 2000 to 1.5 billion in 2011, or 5.16 million trips per weekday.[1] This roughly 25% growth in passenger numbers has made travel conditions increasingly difficult.[2] Surveys conducted by polling organisations (TNS Sofres for RATP 2012) have reported a rise in antisocial behaviour, as well as in the number of complaints relating to delays and discomfort due to the high passenger density (heat, odours, groping, etc.). If these reports are to be believed, the situation has become unbearable.

And yet more and more people take the metro! How do they cope with these difficult conditions? We tried to find an answer to this question by considering the role played by emotions (for a more detailed account, see Aranguren and Tonnelat 2014). We were interested not in the sporadic spectacular scenes, caused by a fight or a panic attack, but rather in the frequent, discreet emotions of metro users who are simply caught up in the mass of other passengers. We were more particularly interested in what happens when riders get on and off the train, always a delicate part of the metro journey. By examining riders' reactions to unexpected physical contact, we found that the emotions involved were crucial to the smooth operation of the system. Emotions help passengers minimise intrusions into their most personal territory – their bodies and their clothes – and thus also potential damage to their "face" or self-esteem (Goffman 1973). They quickly and discreetly express discomfort and enable the victims of such intrusions to obtain reparation or issue silent judgements about their offender. And, contrary to the conventional wisdom, neither outcome involves "making a scene" or disrupting the regular functioning of the metro.

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[1]   This article is based on research conducted by the CNRS–LAVUE research laboratory for the "Mission Prospective" (Futures Department) of the Régie Autonome des Transports Parisiens – RATP – which operates the Paris metro. This research is presented at length in a report for the Mission Prospective (Aranguren and Tonnelat 2013). The main results and the details of the methodology are now available in English in a scientific article (Aranguren and Tonnelat 2014, forthcoming).

[2]   Of course, RATP makes every possible effort to absorb the rising numbers of passengers – for example, by increasing the frequency of trains or using higher-capacity rolling stock. When these measures reach their limits, the next step is to install automatic platform-edge doors on the busiest lines, such as Line 1 (the main east–west line, from La Défense to Vincennes via Châtelet) or Line 13 (a very busy north–south line running from Saint-Denis and Asnières–Gennevilliers to Châtillon–Montrouge via Saint-Lazare and Montparnasse). In addition, "passenger traffic agents", recognisable by their fluorescent orange jackets, are in charge of limiting density in the cars by preventing passengers from boarding trains that are already full at peak hours. Despite their effectiveness, these measures are struggling to contain ever higher passenger volumes in trains and on the metro network in general. Furthermore, as ridership continues to increase, the number of "accidents involving passengers" quite logically increases, causing traffic delays that are especially difficult to manage given that the system is already at capacity.

Analysing passengers' facial expressions

We know that emotions are rarely expressed in the metro, an environment largely governed by fleeting non-verbal exchanges and by "civil inattention" (Goffman 1973) – a means of making privacy possible in situations of close proximity by paying no more attention than is necessary to the other people present (for example, by refraining from staring; see Tonnelat 2012). Therefore, in order to examine the relationship between passengers' emotions and rider density, we needed to adopt a protocol for data collection that would enable us to record the behavioural cues that partially escape individuals' control and betray their mostly controlled emotions that are otherwise largely contained. For this reason, we decided to use inconspicuous portable video cameras to document passengers' facial reactions to physical contact, which we then described using the Facial Action Coding System[3] (Ekman and Friesen 1978). What did we find?[4]

The following description provides an initial preview of our findings.

Friday 6 July 2012, around 6 p.m., République station, on the Line 5 northbound (Bobigny) platform, level with the middle doors of the last carriage of the train.

It is rush hour. On the platform, a lot of people are waiting for the next train. When it arrives, a minute or so later, and the doors open, the passengers on the platform have a little difficulty separating themselves into the usual two lines, one on each side of the doors. Six people get off the train. As soon as the second-to-last person steps off, the flow of incoming passengers begins on the right-hand side, while on the left-hand side a white man in his thirties, with a suitcase and rucksack, is slow to get out of the way. In all, 22 passengers get on the train in two lines, adding to the 11 riders already standing in this section of the car, sharing the 6 m² (65 sq. ft) space between the doors and the folding seats (making an average of more than 5 passengers per square metre).

When the signal warning of the closure of the doors sounds, the last passengers to get on the train have to make do with the space between the central vertical pole and the doors. A tall, thin black man, with small round spectacles and short hair, dressed in dark clothes and wearing headphones around his neck, steps on to the train while looking to the side, shoulder first. Pushed by a plump young white woman, with her hair in a large bun and wearing fashion earrings, who gets on the train at the last second, he twice jostles another passenger, a small young woman of East Asian origin with long black hair and spectacles, who he had already pushed a little when getting on the train. He then turns his head towards the woman who pushed him, as if to protest about the treatment he has suffered, and perhaps also

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[3] FACS (Facial Action Coding System) is an anatomically based method for objectively describing facial activity, which associates visible changes on the surface of the face with the action of the underlying muscles. What we call "expressions" of emotions are compounds of facial action units as defined by FACS. This system uses nearly 30 "action unit" codes (AUs) for appearance changes due to the action of specific facial muscles or groups thereof, plus a number of additional codes to describe head and eye movements, along with "gross behaviours" (e.g. head shaking, shrugging shoulders). Each code is identified by a number; compound facial configurations are denoted by series of single codes connected with "+" signs (see Figure 2).

[4] The data-collection protocol was declared to the Commission Nationale de l'Informatique et des Libertés (CNIL, the French national data-protection commission) under registration number 2-12024. Posters were displayed on the platforms selected for data collection. Leaflets were also printed for distribution by investigators and RATP staff to members of the public interested in the research. These materials briefly explained the purpose of the research, and provided contact details so that passengers could request a copy of the videos in which they appear and/or their removal from the database. The poster and flyer also specified that recognisable images of faces would be seen by members of the research team only, and in any event would not be disclosed outside the research laboratory without first being anonymised.

about what she had made him do. A few seconds later, arching her back to draw in her body and avoid the closing doors, she opens her mouth wide in an "O", highlighting, somewhat in the manner of a toreador, her dexterity and the fact that she only just made it. Concluding her gestures with a broad smile, she receives in return a sign of approval from the young man in the form of a nod and a few inaudible words.

Behind him, at the same time, the woman he jostled frowns and raises her eyebrows, while turning towards the source of the contact, trying to catch the young man's gaze. But, occupied by the scene unfolding behind him, he does not notice her silent reproach. He even repeats the offence, his small rucksack once again making contact with the woman's shoulder. Again, she raises her eyebrows and turns her head and eyes towards him, but still without successfully making eye contact. Finally, she tightens her lip corners inwards and ceases to be concerned about the source of this unwelcome physical contact. As the train starts to move off, her face regains a neutral expression.

Crowded trains and a variety of reactions to physical contact

First, the analysis of many sequences of passengers getting on and off metro trains at two stations (over 700 on–off observation units on the platforms of Line 5 at République and Line 13 at Montparnasse–Bienvenüe) enabled us to measure the passenger density on platforms and in trains during the morning and evening rush hours. Density varied between 2 (little contact) and 6.5 persons per square metre (very crowded) inside the cars (see Figure 1). These figures are probably even higher for some trains on suburban RER[5] lines A and B, for which we did not obtain permission to film. We also found that the stop time at stations, which varied between 22 and 35 seconds (excluding unusually long technical incidents), is directly related to the passenger density at the busiest carriage doors.

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[5] Translator's note: the RER (*réseau express régional* – "regional express network") is a rapid cross-city rail system that covers a much wider area than the metro network (which only serves the city of Paris proper and certain very close suburbs) and which has much longer intervals between stations. Unlike conventional suburban rail lines, RER lines cross central Paris (mostly underground) rather than terminating at one of the central mainline stations.

Figure 1: Frequency of passenger densities in metro trains, based on measurements taken on 436 Line 5 trains at République station, northbound (towards Bobigny), between 5.30 p.m. and 7.00 p.m., in June 2012
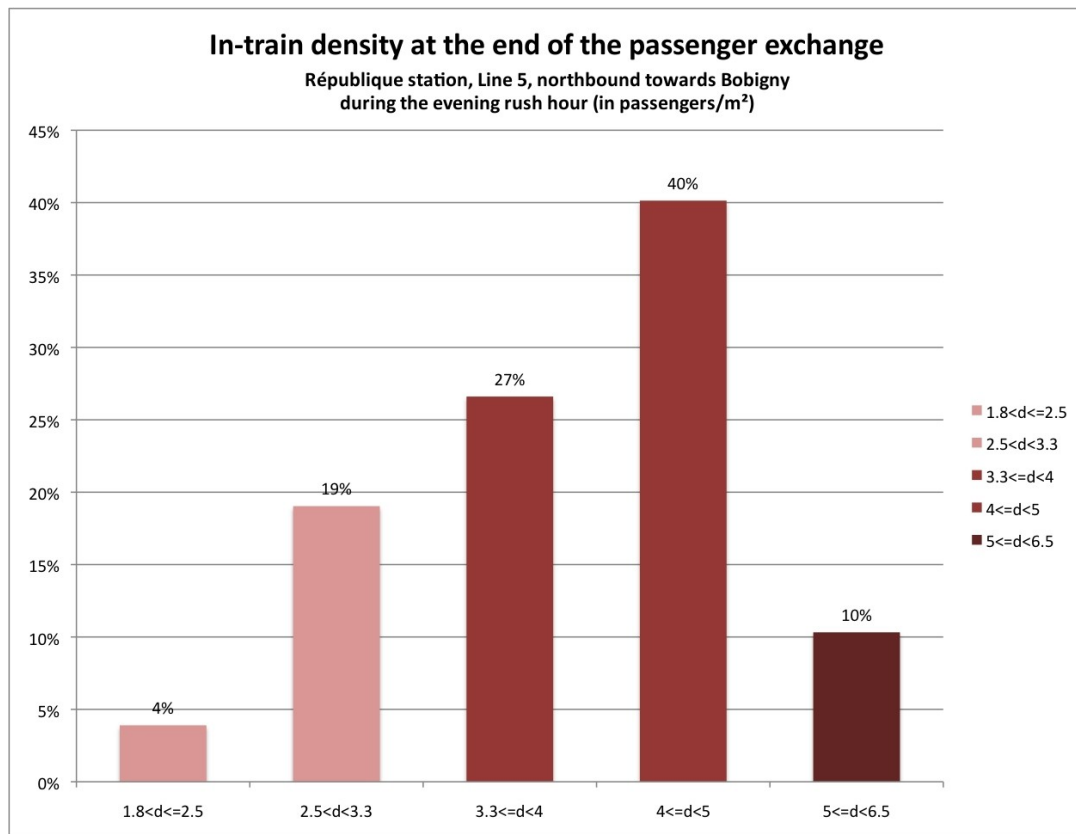
Next, we measured the probability of a passenger reacting to unexpected physical contact while getting on or off a train. We called this a *contact incident*, consisting of physical contact followed immediately by a facial movement on the part of the person touched. These facial movements include, in particular, activity of the muscles of the forehead and mouth. At the start of our research, we found that the response to physical contact, even rough contact, between people who know each other or are helping each other is limited to a movement of the eyelids (blinking or opening the eyes). Conversely, when passengers are not in a situation of mutual acquaintanceship, we observed an additional movement of the forehead or mouth that we interpreted as a sign that this physical contact was appraised as a *territorial violation* (Goffman 1973), that is to say an intrusion into the passenger's personal space.

We then measured, at various passenger density levels, the probability of a contact incident occurring. The results show that the likelihood of such an incident increases steadily with density on the platform and in the train, reaching certainty once the density reaches the high levels characteristic of peak times. We interpret this result as evidence of lack of habituation to contact. Even though passengers cannot ignore the fact that contact will occur at peak times, they nevertheless continue to consider it offensive, regardless of gender, age, skin colour, etc. In other words, passengers evaluate contact between strangers negatively even when it is inevitable.

Furthermore, as density rises, incidents of physical contact also tend to involve more passengers, as many riders push not one but two others, who in turn push someone else, and so on. In the end, we were therefore able to establish not only that there is a high density of passengers and of contact between them, but also that the discreet emotions that these incidents trigger are omnipresent.

In parallel, this probability analysis also highlighted the very small proportion of emotional scenes, that is to say negatively evaluated contacts that escalate into open conflict (1 episode in 700 units) or, conversely, that are resolved through public reparation, i.e. a verbal apology audible

to the other passengers present. This first stage of the research therefore left us with a paradox: how is it that so many emotional departures lead to so few acts of communication and conflict? In other words, how do passengers manage to remain so calm?

Two recurring emotional trajectories: repair and disapproval

In the second stage of our work, we used two cameras – one on board the train and the other on the platform – to monitor the ways in which passengers who were victims of unwanted contact managed the situation beyond the first noticeable facial reaction. The procedure allowed us to identify two common emotional trajectories.[6] The first emotional path repairs the offence, while the second expresses a form of contempt for the person who caused the contact. Both trajectories begin in the same way: following a contact incident, the victim frowns and raises their eyebrows.[7] They then direct their gaze towards the origin of the physical contact, as if to verify what just happened and, at the same time, indicate to the offending party that they are well aware of the wrong done. At this point, the offending party (who jostled the victim) will often catch the gaze of the victim and immediately look down, in a gesture researchers on emotions consider the prototypical expression of embarrassment (Keltner 1995). The sequence reaches closure as the victim looks away and their face returns to a neutral expression.

Without a word, and without even needing to know what each other thinks of the incident, a form of peaceful resolution has been found. The non-verbal repair work functions as an apology, without the offender actually having to formulate a verbal apology or admit fault.

Sometimes, when the victim tries to make eye contact with the offender, the field of vision may be blocked, or the offender may have their head turned in the opposite direction. In this case, non-verbal repair work cannot take place. In most cases, the absence of eye contact is followed by another incidence of physical contact (a repeat offence), causing the victim to once again frown and raise their eyebrows. This time, however, instead of trying to catch their offender's eye, they simply tighten their lip corners inwards, in a typical expression that researchers associate with contempt (Ekman and Heider 1988; Izard and Haynes 1988), before returning to a neutral face. This form of disapproval is another common way to close a contact incident by discharging the emotional tension caused by the contact. Although no repair is accomplished, victims render the situation acceptable by adopting the moral high ground with regard to their offender. Surveys and spontaneous accounts by passengers confirm this finding as they show that users of the Paris metro deem the absence of an apology after a physical contact incident to be an offence.[8] One can only speculate about the silent judgements that riders pass on certain categories of people ("Oh, young people today!").

The diagram below illustrates the typical trajectories of non-verbal repair and disapproval. "P" stands for the "patient" (victim) and "A" for the "author" (offender) of the physical contact incident.

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[6] We used a piece of software called *Theme* to estimate the degree of correspondence between successive facial expressions in 45 observed courses of action. The level of statistical significance for the analysis was set at 0.0001.

[7] The correct FACS terminology would be "lowers and raises their eyebrows". We have kept the expression "frowns" here for better legibility.

[8] See (in French): www.chervoisin2transport.fr.

Figure 2: Typical emotional trajectories: non-verbal reparation and contempt
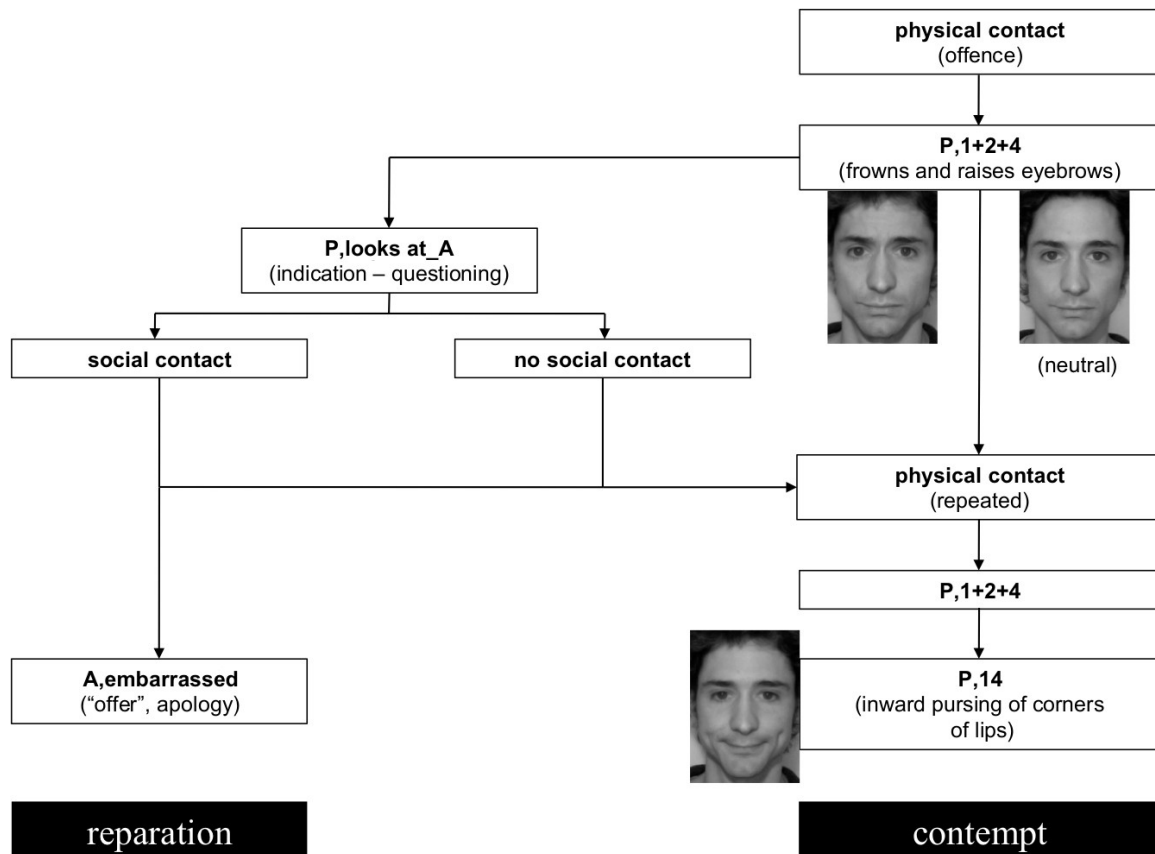
Emotions help calm down the situation

To conclude, it appears that certain emotions are important means of managing problematic situations, rather than occasional uncontrolled outbursts. The expression of such emotions allows passengers to communicate and release the tension caused by unwanted physical contact. More simply – and somewhat counter-intuitively – in the metro, emotions contribute to calming the situation. The two emotional trajectories presented here both serve to maintain the normality of appearances. The small-scale emotions triggered by density and physical contact therefore constitute an extremely robust base for social order in the metro. This is what we believe explains the remarkable restraint of all these passengers who, instead of hitting one another, remain stoical, in all seasons and weathers, both on the platforms and in the train cars. Accordingly, in a nod (FACS code M59!) to a famous social network theory (Granovetter 1973), this research underscores the strength of weak emotions. It remains to be seen whether these small-scale emotions are still effective at passenger density levels even higher than those observed here. Up to what point do they still work?

Bibliography

Aranguren, Martin and Tonnelat, Stéphane. 2013. "Les visages du métro (la force des émotions faibles) : contacts physiques, transactions émotionnelles et densité de voyageurs dans le métro de Paris", *Rapport RATP, Mission Prospective*, no. 170, 200 pages.

Aranguren, Martin and Tonnelat, Stéphane. 2014. "Emotional transactions in the Paris subway: combining naturalistic videotaping, objective facial coding, and sequential analysis in the study of nonverbal emotional behavior", *Journal of Nonverbal Behavior*, forthcoming.

Ekman, Paul and Friesen, Wallace. 1978. *Facial Action Coding System: A Technique for the Measurement of Facial Movement*, Palo Alto: Consulting Psychologists Press.

Ekman, Paul and Heider, Karl. 1988. "The Universality of a Contempt Expression: A Replication", *Motivation and Emotion*, vol. 12, no. 3, pp. 303–308.

Goffman, Erving. 1973. *La Mise en scène de la vie quotidienne. Volume 2 : Les relations en public*, translated by Alain Khim, Paris: Éditions de Minuit.

Granovetter, Mark. 1973. "The Strength of Weak Ties", *American Journal of Sociology*, vol. 78, no. 6, pp. 1360–1380.

Izard, Carroll and Haynes, Maurice. 1988. "On the Form and Universality of the Contempt Expression: A Challenge to Ekman and Friesen's Claim of Discovery", *Motivation and Emotion*, vol. 12, no. 1, pp. 1–16.

Keltner, Dacher. 1995. "Signs of Appeasement: Evidence for the Distinct Displays of Embarrassment, Amusement, and Shame", *Journal of Personality and Social Psychology*, vol. 68, no. 3, pp. 441–454.

TNS Sofres for RATP. 2012. *Top 10 des incivilités constatées*, Paris: Observatoire des Incivilités dans les Transports.

Tonnelat, Stéphane. 2012. "Confiance et émotions dans le métro de New York", in Le Mouël, Éloi and Espinasse, Catherine (eds.), *Lieux et Liens. Tome 1 : Des lieux qui créent des liens*, Paris: L'Harmattan, pp. 205–217.

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