

The Psychology of Queuing

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Abstract

Queuing is still a fundamental function of how many businesses operate, yet there is not a clear understanding to impact the queuing environment to increase the amount of time an individual is willing to wait, improving an individual's queuing experience, as well as reduce frustration and renegeing. This paper presents a synthesis of the academic literature on queuing phenomenon. In particular, the paper focuses on the social norms of queuing, how they are upheld, and reactions to when they are violated; and environmental moderators, examining the impact of factors such as queue length, presence of information, music, light, and scent. Issues like the effect of number of people in a queue, personal space and the ideal queuing environment are discussed. Finally, this paper addresses limitations within the current body of research as well as proposing an agenda for future research.

Keywords

Queuing, Waiting, Time, Environmental Moderators, Social Norms, Personal Space, Ideal Queues

1. Introduction

For many organisations customer disgruntlement at waiting times is a serious issue that demands solutions. It leads to “queue rage” which is physical and verbal abuse as a function of even minor delays.

Products are consumed, but services are experienced in real time. Delay is often the most important factor influencing restaurant evaluation. It is a serious problem for management, who know the cost of hiring extra hands. Expectations have changed with respect to service and “fast-foods”: people take their custom elsewhere, where they get what they want namely a form of instant gratification.

It is difficult to get good evidence about queuing; Time of day and seasonal effects; the most cost-effective way to reduce queuing time; cultural differences in reactions to queuing. There is also surprising lack of good experimental studies on queuing.

The use of technology to reduce queuing such as “self-scanning” in supermarkets and e-passports in airports have been very successful attempts to reduce queues as well as staff costs. Indeed the use of different forms of technology are seen as major ways to reduce the necessity of queuing.

However, there are numerous articles and observations on how people behave in queues. In a well quoted early paper [Maister \(1985\)](#) makes eight observations:

1) *Occupied Time feels shorter*. Give people something to do or distract their attention. Make them walk round and round on maze-like paths. Give them television to watch, music to listen to. The worst alternative is letting them grow surly and listless; they then mumble to each other about starting a revolt.

2) *Uncertainty makes waiting seem longer*. Tell them (roughly) how long they have to wait and people are more accepting of the delay. The London underground and buses have realised this. The “gestimations” need not be accurate; precision does not matter. Information takes away the ambiguity and gives a person the confidence that the system is still running.

3) *Anxiety makes the wait seem longer*. “Will it ever come; will I make my next meeting; will I make the connection?” Thus, explanation and reassurance works and music might help. Too-frequent apologies do not as people become aware this is just a standard tape going round-and-round.

4) *Unanticipated and Unexplained Waits are worse*. Some organisations have realised the importance of giving an explanation. Your train/flight is late (and we profoundly apologise) due to the late arrival of the other train/plane.

5) *Unfair Waits are much more aggravating than Equitable Waits*. Nothing is worse than seeing someone semi-legitimately avoid the queue. The Fast Trackers who buy their way out; the cabin crew who get some privileged exit; the locals who have twice as many people manning the desks as the aliens. The spirit of “all in it together”, “equal suffering” helps.

6) *Solo Waits seem longer than Group or Social Waits*. This is a difficult one, but explains the idea of a waiting room or one of those holding pens at airports.

7) Pre-process waits seem longer than in-process waits. Waits seem longer if you are waiting for your service to begin than if you’re already waiting as you’re being served. For example, waiting in line at a bar normally seems worse than waiting for the bartender to make you your drinks.

8) People wait longer for more valuable services. This explains why people would wait longer for medical attention for A & E than they would buying a pint of milk at their nearest corner shop.

2. The Academic Literature

There is a surprising large academic literature on the psychology of queuing. For instance, [Fagundes \(2016\)](#) suggested queues offer many rich insights into the so-

cial norms and human behaviour. There are social rules about queuing though these differ from culture to culture, as do how people react to those who break the rules. He notes:

“There is little evidence that we are all selfish homineseconomici; rather, we tend to be strong reciprocators, inclined to cooperate when we see others doing so, provided that we do not see anyone free riding at the expense of our generosity. And queue norms and practices dovetail neatly with both the collaborative and punishing sides of our inclination toward reciprocity. Physical waiting lines send a clear and strong signal about the prevalence of mass cooperation. The sight of a thousand or even a few people waiting patiently in line communicates the essence of human cooperation (and tends to understate defection) in a way designed to trigger others’ instinct for reciprocity. Moreover, the outsized rage people exhibit at breaches of queue protocol—especially the odious practice of line cutting—provides an effective disincentive for the small but problematic percentage of the population that is inclined not to cooperate. These non-co-operators threaten to unravel informal systems of order by creating a widespread perception of free riding. However, the very real chance that they will meet with shouts, fists, or worse keeps even the relative minority of committed line-cutters at bay and preserves the stability of queues. As the conclusion to this article remarks, the mundane character of the line belies its richness as a source of insight for life and law alike.” (pp. 2-3).

There are fascinating studies of what people do in queues to reduce their frustration (Pamies, Ryan, & Valverde, 2016). All sorts of factors influence how people react to queues. For instance, in a study of how people reacted at transportation stops found:

“Results from the survey and video observations show that the reported wait time on average is about 1.21 times longer than the observed wait time. Regression analysis was employed to explain the variation in riders’ reported waiting time as a function of their objectively observed waiting time, as well as station and stop amenities, weather, time of the day, personal demographics, and trip characteristics. Based on the regression results, most waits at stops with no amenities are perceived at least 1.3 times as long as they actually are. Basic amenities including benches and shelters significantly reduce perceived waiting times. Women waiting for more than 10min in perceived insecure surroundings report waits as dramatically longer than they really are, and longer than do men in the same situation. The authors recommend a focus on providing basic amenities at stations and stops as broadly as possible in transit systems, and a particular focus on stops on low-frequency routes and in less safe areas for security measures.” (p. 251).

Furthermore, Bailey (2019) outlined differing reasons for waiting: *Anticipatory waiting*: waiting for something that is hoped-for, for example, waiting for Christmas through advent. *Inefficiency-based waiting*: waiting for slow management processes or due to human error. *Scarcity-based waiting*: caused by lack

of availability of resources, e.g. black Friday queuing *Time-delay based waiting*: natural or inevitable process, e.g. defrosting your car windscreen. *Waiting caused deliberately by another party*: deliberate withholding of information or other resources which causes delays.

3. Social Norms in Queuing

Research into queuing phenomenon has indicated that it is a social system with rules, norms, and obligations (e.g. Schmitt et al., 1992). Anger, frustration, and upset occur when these norms are violated. In this section, we discuss the research on different “no nos” for queuers. One of the most well-known and researched “no no” in British queuing is when someone cuts ahead of us in the line. Illegitimate intrusion sparks outrage as it appears to violate the socially accepted norms of the queuing environment. It usually sparks a chorus of tutting, eye-rolling, and groaning in the direction of the queue jumper.

Traditionally social justice in queues is defined and measured with adherence to the “first in, first out” principle (Larson, 1987); that because I was here first, I get to be served first. First-order justice is maintained when the first in, first out principle is upheld. Second-order justice, however, states that people should wait an equal amount of time to you, regardless of its effect on your waiting. For instance, at a busy restaurant, servers may decide to open a new seating area to accommodate. This means people who have waited longer (those at the front of the queue) may be served at the same time as those who have just arrived. Whilst those who arrived first are still seated first, evidence demonstrates that second-order justice violations still decrease positive affect and increase negative affect (Zhou & Soman, 2008).

Despite this being something most people (especially British queuers) are outraged by, the response can often be very different. In a classic study by Stanley Milgram and his colleagues (1986), researchers cut into 129 queues at in various locations (including train stations and betting parlours) by simply saying “Excuse me, I’d like to get in there”. In only 10% of cases did the queuer physically not allow the experimenter to cut in line. For roughly 50% of cases the queuer reacted (with a mean look, tutting, an eye-roll, or verbal objections) but allowed the researcher to cut in. However, when Milgram upped the number of queue cutters to two people instead of one, the rate of objection increased to 91%.

He argued from his findings that people in a queue are not really a group. Group formation is difficult when people are stood one behind the other, all facing in the same direction. Consequently, social order is weak. Further, it is costly to deal with deviants. Challenging queue-jumpers could mean losing your own place in the line. We can cope with a few deviants. Social systems have to tolerate some deviance otherwise they may quickly break down, i.e. a fight may start and everyone is delayed while it is sorted out.

Ellen Langer and colleagues (1978) also found that the type of excuse offered

by a queue-jumper could change how successful they are. When cutting in line to use a photocopier, Langer presented three types of excuse. In the first, experimenters offer the *Request Only* excuse of “Excuse me, I have 5 copies to make. May I use the Xerox machine?”, resulting in 60% allowing her to go ahead. The second excuse presented *Placebo Information* by stating “Excuse me, I have 5 copies to make. May I use the Xerox machine because I need to make copies?”, resulting in 93% allowing her to go ahead. The final excuse was *Real Information*, where experimenters asked “Excuse me, I have 5 copies to make. Make I use the Xerox machine because I am in a rush?” resulting in 94% allowing her to go ahead. The results suggest that when you are making a small request (i.e. only 5 pages), it does not matter what your excuse is, only that you have one. However, when the request is bigger (e.g. needing to make 20 copies), excuses start to matter. Presenting *Request Only* (20%) or *Placebo Information* (24%) excuses have similarly unsuccessful results, whereas presenting a *Real Information* excuse (42%) causes people to be more obliging.

Helweg-Larsen and LoMonaco (2008) examined the effects of cutting in line with fans queuing for a U2 concert. Queuers reacted more negatively when the intruder was a stranger than a friend of another queuer. The effects were equivalent for when the cutting in occurred in front or behind them, and was not altered by queue position (30th vs. 175th). Fan commitment also moderated the level of upset, with more committed fans experiencing greater upset than casual fans. However, if the queue-cutter is a friend of another queuer, upset is significantly reduced if the queuer is informed beforehand of a late-arriving (and thus queue jumping) friend.

Dold and Khadjavi (2017) examined queue jumping further using groups of 3 queuers, in simulated laboratory conditions. Over several conditions, they allowed the lastqueuer to financially bargain with the first, allowing them to skip the queue and leave the experiment at the same time of the first person, saving themselves 20 minutes. Unique to this experiment, however, was that the middle queuer was told that if a bargain was made and queue jumping occurred, their own queue time would not increase. Doing so isolated any egoistical ill will the middle queuer had towards the other two, focusing only on justice and fairness. To enforce any social norms, the middle queuer had the option to punish the other queuers, causing them to wait longer in the queue, but for every three minutes of wait time they extended, they must wait an extra thirty seconds themselves.

Dold and Khadjavi found that the last queuer significantly made more queue jump offers if there was no middle person present, than if there was and could punish them for the bargain. Furthermore, the middle participant queuing consistently chose to punish the person ahead of them, accepting the queue jump offer, more than the one cutting the queue. Asking the participants, the biggest reason for this was due to a perceived distributional unfairness, and slightly less so due to procedural justice in conditions where the middle subject witnessed the bargaining. This further suggests a need to maintain social norms, even in ab-

stract conditions, and that people leading queues are seen to hold a greater responsibility to maintain these norms, than those further back.

Additional recent research has suggested that people in queues tend to reciprocate social norms while in self-service queues (Kim, Lee, & Park, 2018). Even while participants remained anonymous in simulated online environments, they spent similar time in self-service to the former customer. In fact, participant service time was also found to decrease from the former customer if there was social pressure, created by a queue of 16 people behind them.

4. Queuing as a Loss

Time spent in a queue has an opportunity cost for all members, taking up time that could be used to do something else. The time spent is valued subjectively for each queuing member (Bailey, 2019). For self-perceived high-status people, waiting in queues can be seen as submission; for productive people, queuing means that can't get work done; and those who highly schedule themselves and more time-conscious may be more conscious of the time they are losing. This could be why younger people are more tolerant of longer wait times (Jones & Hwang, 2005; Ting, Huang, Lin, & Pan, 2019) and that people were more likely to leave restaurant queues in the afternoon, and on weekdays (De Vries, Roy, & De Koster, 2018), typical work hours where customers' time likely is more pressured. This is supported by Lin, Xia and Bei (2015) work which showed that, in laboratory conditions, the perceived value of time increases with time pressure; where time pressure was measured by a 11-point scale which primed participants of their engagements following the experiment. Interestingly, however, people who have a tendency to multi-task and are more flexible in how they use their time may be less concerned by longer queues (Leroy, Shipp, Blount, & Licht, 2015). Organisations can use this to their advantage by managing queues, developing promotional activities, and improving the waiting environment, all of which have a positive effect on time perception (Liang, 2019).

Furthermore, the opportunity cost of longer wait times could be more detrimental as Lin et al. (2015) also found that perceived longer waiting times cause greater negative affect than positive affect cause by perceived shorter waiting times of the same differences. This again highlights the need to manage customers' perceptions and expectations of waiting times while queuing.

What is the optimum length of time to queue for before we get itchy feet?

When we are in need of a service—e.g. buying your shopping, posting a letter, or using toilet—we appreciate that there is a *psychological cost* we may incur in the process of obtaining that service. Research into the psychology of queuing has assessed the psychological costs that consumers are willing to expend while waiting, and how to reduce them.

In situations where the service is non-essential, the consumer will make trade-off judgements whilst they are in the queue (Carmon, Shanthikumar, & Carmon, 1995). Consumers will engage in an economic analysis of the opportunity cost of

waiting (the psychological cost that could be used elsewhere; Becker, 1965) and the principles of marginal decision-making (Frank & Glass, 1991). How much additional psychological cost—e.g. waiting time, hassle, financial cost of moving through the queue quicker—is the consumer willing to expend in order to complete the queue situation? Consumers decide to “renege” and abandon the queue if the additional cost needed exceeds the threshold of what the consumer is will to “pay”.

These thresholds will vary depending on certain situational factors of the queue. The optimal length of time we are willing to wait depends on several factors: the absolute time the consumer has been waiting; the number of people ahead of us in the queue; and the number of people behind us in the queue.

5. Time Spent in the Queue

The optimal amount of absolute time a consumer is willing to spend in a queue before renegeing varies depending on the service they are waiting for. For instance, the average time people will queue for an ATM before renegeing is 3 minutes (Zhou & Soman, 2003), whilst people will queue for 59 minutes on average for a *Paul Gauguin* art exhibit (Meyer, 1994). Of course, these numbers may be different in different cultures and different times as expectations and experiences of waiting have changed.

What is important to consider with queuing is how long the consumer expects and perceives to have been waiting for. The longer a consumer queues past the expected waiting time and greater the psychological cost of remaining in the queue, and the more likely they are to renege. Disneyland and Disney World have been experimenting with queuing and customer satisfaction for decades. They found to alter how long a customer is willing to wait, it is most effective to influence the expectations of the customer. Disney resorts will always generously overestimate the waiting times for their attractions, meaning customers come away grateful for getting through the queue in a much shorter time to what they expected.

Consumers have been found to be consistently inaccurate at estimating how long they think they have been waiting for. One study found that consumers retroactively estimate they waited 78% longer than they actually have (Katz, Larson, & Larson, 1991). However, wait estimations dropped significantly to 22% when consumers could see an electronic clock that gave an estimate for how long their wait would be. This has been repeated several times since but the effect is more reduced, ranging between 2% - 37% outside of fast food vendors (Antonides, Verhoef, & Van Aalst, 2002; Jones & Huang, 2005).

Meyer (1994) ran a field observation to investigate how the subjective importance of reaching the end of the queue impacted how long a person was willing to wait. Over 6 days, researchers observed a naturally forming queue for a temporary art exhibit. The researchers measured how long the queuers had been waiting and interviewed them at fixed distances from the front of the queue (8, 16, 32, 56, 88, and 132 m).

Meyer found that the importance the queuer placed on the exhibit (i.e. whether they ranked the artist as their favourite of that movement/period) influenced how long they were expected and willing to wait. “High-importance” queuers estimated there to be fewer people in front of them in the queue, to be a closer distance to the front of the queue and expected to wait in line for less time. For “low-importance” queuers, the longer they spent queuing and further back they were, the more displeased and frustrated they were.

Previous research has demonstrated how mood (e.g. frustration, boredom, anxiety) predicts a greater likelihood of abandoning a queue (Janakiraman, Meyer, & Hoyer, 2011). As time had no effect on the mood of high-importance queuers, it demonstrates the significance of goal-importance on renegeing from a queue—the more important it is to get to the end of a queue, the less affected you are by queuing and the longer you are willing to wait.

Finally, consumers are also susceptible to the *sunk-cost fallacy* when waiting in line. As such, the time a consumer has been queuing increases with the amount of time they are willing to wait (Katz et al., 1991). Consumers will feel that the psychological cost of waiting further in the queue is reasonable given the amount of time that they have already waited, despite having inaccurate perceptions of how long they have waited and how long it might take to reach the end of the queue.

Counter-intuitively, there are conditions where time spent queuing can increase customer satisfaction (Giebelhausen, Robinson, & Cronin, 2011). In cases where customers’ main motivation is quality (not convenience), queues for restaurants act as a proof of quality, and increase customer satisfaction and demand. In familiar restaurants, however, there was a negative trend in perceived quality. While insignificant, this suggests that when quality is known, queues may be attributed to poor customer management, rather than good service quality.

6. Beating the Clock—Queuing Estimations

Seemingly, the best time spent in the queue, however, is whatever shorter than the customer expected. Many researchers have studied the “perceived wait time” of customers and how that affects customer satisfaction.

Customers have been shown to have expectations of the product or service they are waiting for. Efrat-Treister et al. (2019) measured the levels of violence caused while waiting for treatment in an Israeli hospital. They found while crowdedness predicted incidents of violence, it was moderated by the perceived system load (how busy the hospital was) and their expected wait time, in that higher load and higher future waiting predicted violence. This shows the danger of negatively breaking expectations for customers. While violence is an extreme example, the data were collected in high pressure hospital emergency department, feelings of negative affect will likely still be present in everyday activities, but likely to a lesser extent.

Alternatively, Lee, Chen and Hess (2017)’s research on online shopping beha-

viours focused on positively breaking customer expectations of queue times. They studied the difference in customer experience when waiting time was tracked by an accurate progress bar, where the customer stopped waiting upon 100% completion, or a “hedonic” progress bar which only reached 80% completion before the wait finished, exaggerating initial completion time. Across short and long waiting conditions, the exaggerated time progress bar increased perceived enjoyment and time distortion and had further increased time distortion when paired with other distractors. These two studies suggest that customers create expectations of wait time from the waiting environment, whether that is from crowdedness, visual estimates, or otherwise. As such, giving queuing customers a 25% wait time buffer may positively affect their experience when the actual wait time is shorter, in addition to preventing negative customer affect and behaviour from wait times exceeding their expectations.

7. Number of People in the Queue

A key factor in deciding whether to remain or renege from a queue depends upon the number of people who are ahead of us in the queue (Carmon & Kahneman, 1996). Evidence has shown that when there are more people ahead of us in the queue, we are more likely to renege (Zhou & Soman, 2003). Consumers will estimate how long they expect to be waiting by the number of people ahead of them (Meyer, 1994). When this number appears too high, consumers will either renege or refuse to join the queue in the first place; the latter is far harder to measure and could even have caused many papers to underestimate the negative effect queuing has on business revenue.

As with the number of people in the queue ahead of us, the number behind us also influences our likelihood of renegeing from the queue. This factor is of particular interest because, from a purely cost/benefit analysis, the number of people behind you in the queue has no objective impact on your additional waiting or position from the front. Yet, the evidence suggests that it does have a significant effect.

Consumers will make social comparisons with others behind them, deriving some form of comfort from looking behind and realising they do not have to wait as long as them (Zhou & Soman, 2003). A great deal of research suggests that when people are feeling anxious and unhappy about their current status, downward comparisons (looking at those behind you) are more likely to occur (Wills, 1981) over upward comparisons (looking at those ahead). As a result, individuals will feel more positive and less negative affect when there more people behind them in the queue.

Zhou and Soman (2003) demonstrated the importance of people behind you not only in altering mood, but also in reducing renegeing behaviour. In a series of experimental and naturalistic studies, it was found that an increased number of people behind significantly reduced the likelihood of renegeing (after controlling for the number of people ahead in the queue).

Kim, Lee, and Park (2018) also showed that a queue (of 16) people behind increases social pressure on the customer when in a queue to try out a new phone. Participants were more likely to take less time testing the product than the previous customer. Without this pressure, participants chose, on average, to reciprocate the time spent by the customer before them.

Dahm, Wentzel, Herzog, and Wiecek, (2018) had similar conclusions in a several contexts. Firstly, customers queuing to use an ATM machine found a decrease in positive affect and an increase in negative affect up until a queue length of 5/6. It is possible that is, however, a non-linear phenomenon as there is an increase in positive affect and decrease in negative affect after a queue length of 6. Affect changes were found to be mediated by social pressure, which could suggest that individuals in Kim et al. (2018)'s study were spending less time in self-service activities to minimise the decreases in mood, not out of altruism. In Dahm et al. (2018)'s third study they looked at customers in a checkout queue and found that customers are more affected by the queue forming behind them when they get to the front of the queue, perhaps due to building social pressure.

However, these effects were only noted in linear queues, and not in "take a ticket" style queuing. "Take a ticket" style queuing reduces the ability for consumers to make social comparisons to where they are in the queue. People behind also had less impact on positive and negative affect.

The number of people behind has a significant impact on how long it takes before queuers get itchy feet and renege. A longer queue behind us causes two psychological changes in the queuer: firstly, it acts as social validation that the queue is worth waiting for (Cialdini, 1985); secondly, it leads the consumer to expect a longer a queue if they renege and re-join at a later point in time (Zhou & Soman, 2003). These two effects cause consumers to become more likely to wait in queues longer.

Lu, Musalem, Olivares, and Schilkrut (2013) investigated this queue style at the deli counter and how that affected purchasing behaviours at a Latin American supermarket. They found that customers primary focus on the queue length more than the rate of service and suggest that supermarkets might create more revenue if they used multiple, slower queues. These results may not be as transferable to line-style queues, however, as customers may only be making judgements based on queue length (or crowd size in ticket queues) due to information on rate of service, and even the number of customers in the queue being hard to estimate without a visible line of people.

8. What Is the Ideal Amount of Personal Space?

Queues are, by definition, social in nature. Most queues involve the strategic and logical positioning of people who are trying to achieve the same goal in physical proximity of each other. The question is whether the amount of personal space we are given impacts our queuing experience.

There are social norms about the interpersonal distance that should be maintained in social environments. For instance, Fry and Willis (1971) tested this concept in queues by sending “invader-children” to stand less than 6 inches behind adults in line for the theatre. The researchers found that the reactions of adults differed depending on the age of the child: 5-year olds were elicited a positive response, whereas 10-year olds were greeted with negative responses. As adults felt that the 10-year old was old enough to understand to spatial patterns and norms, the direct violation of these norms elicited frustration and annoyance to queuers.

Personal comfort when waiting is also affected by the environmental space provided. One study experimented with the level of discomfort displayed in people waiting at the California State Department of Motor Vehicles. When the room was partitioned (ropes and standards; solid wooden partitions), queuers displayed greater discomfort and agitation than when the room had minimal or no partitioning (Stokols, Smith, & Prostor, 1975). As queuers felt more crowded, their discomfort grew. This evidence is further supported by the distinction that people make between pre-process and in-process crowding. For instance, people are experience high levels of negative affect with crowding in queues, whilst being crowded or physically close to others in a concert is seen positively (Mowen, Vogelsong, & Graefe, 2003).

Proximity to others has also been shown to influence the evaluations we make of queues. Schachter (1959) found that the closer we are physically to others, the easier it is for us to make social comparisons. We have discussed how queuers will make upwards and downwards social comparisons when deciding whether to renege from a queue. When we are stood closer to others, these evaluations are made quicker and with greater impact, affecting our chances of leaving the queue.

9. What Is the Ideal Queuing Environment?

Through his work on studying queues, Liang (2016, 2019) has found improving the waiting environment of a queue, for example, through queue management and promotional activities, can lead to the reduced of customers’ perceived waiting time. Following Lee et al. (2017)’s conclusions, this could improve customer enjoyable and be invaluable to the companies. Many methods of improving queue environments have, and continue to be, investigated.

9.1. Retail Distractions

Katz et al. (1991) tried to influence consumers’ perceptions and emotional response to waiting in line by providing distractions. The first was a news board, displaying live news bulletins. Whilst the news board did not reduce the amount of time consumers felt they had waited, it did make it more palatable. Consumers who spent longer in the queue (4 - 12 minutes) were more satisfied with the customer service they received, and rated their queuing experience as signifi-

cantly more interesting, entertaining and relaxing than when no news board was present. The second distraction was an electronic clock that provided estimates of how long the consumers would have to wait. Whilst the electronic clock significantly decreased consumers' perceived waiting time, it did not significantly improve the consumers' level of stress or satisfaction with the customer service. This is because the clock provided consumers with more awareness of how much time was wasted standing in line. The clock also was noted to increase frustration when consumers were not able to "beat the clock" as previously mentioned.

Borges et al. (2015) investigated the effect of having a retail distractor (e.g. TV for consumers to watch) on the perceived waiting times and waiting satisfaction. Customers queuing in drugstores and restaurants perceived their waiting time to be significantly shorter with a distractor present, even though objective wait time was the same. What was being played on the distractor also had a marginal impact; when images were congruent with the retail setting consumers reported shorter perceived waiting times (e.g. videos of food being made in a restaurant vs. the news). Customers also were significantly more satisfied with their queuing experience with a retail distractor, with congruent material having a greater effect than incongruent material.

In Lee et al. (2017)'s previously mentioned study on waiting time in online shopping, visual distractors were also used to help reduce the perceived wait time of their participants. For the distracting "hedonic" condition, the progress bar reflected the business of online flight bookings, showing a bar as plane flying across the screen. This was compared to a "functional" bar which included no images. Comparisons showed that customers following the hedonic progress bar had significantly greater perceived enjoyment of the wait. There was, however, a stronger interaction with the exaggerated time condition when the waiting time was short, which suggests that the visual distractor loses its novelty after more than five seconds.

This year, Garaus and Wagner (2019) tested the effect of having a television on the customer checkouts at supermarkets which displayed information about the supermarket, in addition to quiz-like questions about the company. Over four weeks, data were collected for customer behaviour with and without the sign; this included actual and perceived waiting times, boredom, annoyance, and overall store satisfaction. The signs were found to decrease perceived waiting time by an average of 43%, and decreased negative and created positive queuing time feedback, which also helped to decrease perceived waiting time. A significant effect was not found, however, between the presence of digital signs and store satisfaction. This could potentially be a measurement problem, as Garaus and Wagner (2019) used questions of "I am satisfied with this store", "The score meets my expectations", "The store exceeds my expectations", and "the offered services reflect my ideal states"; in a retail store this could have primed customers to think of accessibility, stock availability and pricing, amongst other things instead of the queue management system.

9.2. Music

There have been several studies that have demonstrated the impact of music on queuing behaviour. Music causes reactions to occur in our limbic system; the emotional centre of the brain. As such, music influences both the mood of the queuers as well as their perception of time (Tom, Burns, & Zheng, 1997).

The question becomes what type of music is best for the ideal queuing environment. Bruner's (1990) review of the effect of music on mood revealed that fast music was associated with positive emotions (happiness and excitement) whilst slow music was associated with feelings of sadness. Familiar music (e.g. contemporary pop music) has been recommended as the most appropriate for waiting situations, since unfamiliar music has been noted to create the perception that time is slowing down (Yalch & Spangenberg, 1988, 2000).

McDonnell's (2007) experimentally investigated the effect of music on waiting frustration and concern. McDonnell (2007) noted that introducing familiar music (a contemporary radio station as background sound) significantly reduced negative emotions and increased positive evaluations of customer service at banks. Furthermore, "likable" music has been found to improve both mood and reduce the perceived annoyance of waiting (Cameron et al., 2003).

This effect remains influential in high-anxiety waiting situations. Fenko and Loock (2014) investigated the role of music on patient anxiety when waiting for plastic surgery. The results indicated that music significantly reduced patient anxiety compared to the absence of music, with instrumental and natural sounds being the most anxiety reducing compared to classical and modern.

9.3. Scent

Studies by Hirsch and Gay (1991) found that certain scents, even in fairly low concentrations can affect peoples' moods. Concentrations so weak that they are below the threshold of consciousness still can affect peoples' moods subconsciously.

McDonnell (2007) used scent as an environmental variable to affect the mood of customers waiting in line. McDonnell used a scent diffuser in the corner of the room to disperse a blended fragrance of lavender, with sagebrush and nutmeg (which has previously been found to reduce anger; Burns, Byrne, Ballard, & Holmes, 2002). McDonnell's investigation found that service evaluation significantly improved when scent is introduced compared to no intervention. Whilst scent was noted to reduce the level of frustration reported by the customer, the effect was not statistically significant.

However, the effect of introducing ambient scent was found to significantly reduce patient anxiety when waiting for plastic surgery (Fenko & Loock, 2014). In particular, scents such as vanilla and lavender were more effective in reducing wait anxiety than scents of mango, lemon, magnolia, and orange.

However, Fenko and Loock (2014) found that there can be "too much of a good thing" when trying to create an ambient and anxiety-reducing waiting environment. In their study, they found that the combination of music and scent

had no effect on relaxing patients. When there is “too much going on” in the waiting environment, this heightens the waiter’s arousal and causes them to become more anxious and aware of how long they have been waiting.

9.4. Colour

Whilst no study has directly looked at the impact of colour on queuing conditions, several papers have extrapolated the possible effects of colour based on similar evidence (e.g. Baker & Cameron, 1996).

Colour researchers generally have categorized colours as being either warm (e.g., red, orange, yellow) or cool (e.g., blue, green). In experimental settings, the effect of the colour has been investigated with perceived time duration (Shibasaki & Masataka, 2014). The results showed that the perceived duration of warm colours (red) was longer than was that of cool colours (blue). In real-life settings, it has been observed that the passage of time tends to be overestimated in a room painted with warm colours and underestimated in a cool-coloured room (National Aeronautics and Space Administration, Johnson Spacecraft Center, 1976).

It is therefore suggested that warm colours (defined in terms of hue, brightness, and saturation) are less appropriate for waiting environments due to increasing negative affect, stress, and perceived waiting time (Baker & Cameron, 1996).

9.5. Lighting

As with colour, there have not been any direct studies looking at the effect of lighting on queuing experience. However, research has demonstrated a link between room lighting and mood. Light level has been found to predict the comfort experienced by individuals, with increased (decreased) comfort in relatively low (high) levels of light (Hopkinson, Petherbridge, & Longmore 1966). In experimental conditions, participants have overestimated time duration under conditions of higher illumination compared to that under lower illumination and estimated longer time duration under higher intensity lights compared to that under lower intensity lights (Goldstone, Lahmon, & Sechzer 1978). This suggests that high light levels will cause lower waiting satisfaction due to decreased comfort and an increase in the perceived passage of time.

9.6. Employee Visibility

The patience of queuers has also been known to fluctuate depending on the visibility of employees. In particular, whether the queuers perceive the employees to be working hard to serve all those who are queuing. Studies have shown that customer satisfaction in banks is strongly predicted by whether queuers believed all tellers to be doing their best to serve all customers (Clemmer & Schneider, 1989). Furthermore, queuers become more frustrated when service providers are not working hard (e.g. talking with their co-workers) as this information is used to predict a longer wait (Larson, 1987).

10. Literature Limitations and Future Research Directions

There appears to be a lot of initial evidence in the psychology of queuing, with researchers attempting to understand the factors that increase the amount of time an individual is willing to wait, improving an individual's queuing experience, as well as reduce frustration and renegeing. However, the research is currently fragmented. There has not been a clear attempt to unify the research into this area, nor to integrate existing theories from behavioural economics or biological (e.g. Shibasaki & Masataka, 2014), social (Meyer, 1994), or organisational (Garaus & Wagner, 2019) psychology paradigms.

The focus of queuing research appears to be split into two foci: the “relative” perception of the queuer, including the presence and behaviour of others; and the “absolute” experience of the queuer, investigating how stimuli (e.g. information, lighting) can alter perceptions (e.g. amount of time passed). Distinguishing these lines of research will help determine how different theories should be incorporated into hypothesis formation and resulting implications. For instance, research on “relative” perceptions should look to utilise insights from social and organisational psychology to impact customer satisfaction and perceptions of the organisation (e.g. when to implement “take a ticket” queues).

Additionally, there appear to be queue-types that distinguish the effects of specific moderators. For instance, compulsory vs. voluntary queuing; Zhou and Soman's (2003) research suggested that the greater the number of people ahead of us for an ATM, the more likely we are to renege. However, what happens in situations where there is a necessity to queue, for instance waiting for a hospital appointment? Will queuers still renege if the queue is long enough—a “critical point” where the wait is perceived to be too long—or will the queuer remain indefinitely? Alternatively, it could be argued that research streams should have distinct lines of inquiry: voluntary queuing research to focus on decreasing chance of renegeing, whilst compulsory queuing focuses on reducing tension during queuing and increasing customer satisfaction. As such, research should focus on comparing the effects of queuing moderators in each environment.

Finally, an area that is missing from queuing research is the role of individual differences. Queuing research currently assumes that individuals will act similarly in similar situations. However, personality traits could moderate the impact of specific interventions. For instance, individuals with higher levels of uncertainty intolerance (i.e. how people cope in complex situations where outcomes are unknown) have higher levels of anxiety (Furnham & Marks, 2013). Research could investigate how interventions that provide information in queues could reduce anxiety in individuals with higher levels of uncertainty avoidance. Additionally, do traits related to impulse control (e.g. impulsivity facets of Extraversion scales; Whiteside & Lynam, 2001) differentiate those who are likely to renege on shorter queues? This currently represents a key gap in queuing literature that could identify when and why certain interventions are having an impact.

11. Conclusion

Whilst to some the studying of queuing or waiting-in-line may seem trivial, understanding a potential customer's response to waiting is essential. Organisations are eager not to get a reputation for poor service which is often associated with waiting times. Changes in technology, especially self-service machinery available widely now in supermarkets and travel places (airports, railway stations), have meant people may be even less tolerant of queues. Indeed, the development of bio-technical markers has made identification must faster often significantly reducing waiting at country borders. Thus, expectations change.

We know that queuing behaviour is a function of many factors: what people are queuing for and their choices available; the length of the queue; the behaviour of people in that queue and distractions and environmental factors. For both consumers and providers "time is money" and both want to minimize waiting in queues. Hence experimentation with new devices and strategies that minimise time spent in queues.

Many people are now shopping online, both to avoid queues but also for convenience. Equally people are using such things as telephone banking. This means that the "physical queue" with people standing in-line is on the decrease; hence the interest in how to get people to keep "hanging" on the telephone in a queue by using music or messages.

There are, of course, many areas of future research such as looking at how to get people to evaluate queues differently; trying to understand when customers renege and the optimal number of paid staff to prevent loss from queue evasion.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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