Can’t switch off: the impact of an attentional bias on attitudes

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CAN’T SWITCH OFF: THE IMPACT OF AN ATTENTIONAL BIAS ON ATTITUDES

by

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To Ma, Poppy & Chinky, who made everything in my life possible. To Bulbul who showers me with unconditional love. To Gauruu who made my whole PhD possible.
ABSTRACT

Extant attention theories explain how individuals direct attention towards different stimuli. However, the theories are relatively silent about how attention is switched off, other than the idea that attention to a stimulus may cease because another stimulus overshadows the first in its demand for attention. We theorized that individuals have a tendency to ‘not switch off’ attention from a current process, in the absence of a competing stimulus that wrenches attention away from it. We present evidence consistent with this attentional bias – individuals continue attending to an ongoing mundane process until it reaches its ‘end’, even when that attention is normatively unwarranted, namely under conditions where (1) they cannot control or influence the process and (2) they are aware of the outcome with a reasonable degree of certainty as well. Moreover, since attention is a limited capacity resource, such attentional hijacking is negatively hedonically marked which gets mis-attributed to salient available targets. Consequently, we also demonstrate decreased positivity in attitudes towards entities associated with the incomplete process.
PUBLIC ABSTRACT

Previous attention theories have thus looked into the question of how we, subconsciously or consciously, decide to pay attention to different entities in the environment. However, past literature is relatively silent about how we ‘cease’ paying attention to an entity or process. Our work is a step towards filling this gap. Our work shows that we as human beings may not have evolved an ‘internal off-switch’ for attention – meaning that we are ‘unable’ to stop paying attention to a process, if there is nothing else in the environment that calls for our attention. This position becomes particularly interesting where an ongoing incomplete process unnecessarily occupies our attentional resources until it ‘ends’, even when this process doesn’t require any more attention from our side. We say that a process doesn’t need any more attention when (1) the process cannot be further controlled by us, and, (2) when the outcome of the process is certain and known from before-hand itself. We show that such an unnecessary chaining of attention, which is a precious and scarce resource, generates negative emotions within the body. Unaware of the correct source of these negative emotions, we often misattribute them to the entities associated with the incomplete process. Such a misattribution results in us having decreased attitudes towards these entities for no fault of theirs. With the help of 9 studies, we investigate and find evidence for our positions. Our work has significant marketing implications for various industries including online banner advertisements, gift cards and money remittance.
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INTRODUCTION

“Any man who can drive safely while kissing a pretty girl is simply not giving the kiss the attention it deserves.”

--- Albert Einstein

An important part of an information processing system built into organisms is attention. The ability to decide what to attend to and deploy processing resources in that direction is essential for basic survival. Empirical results from early shadowing experiments involving dichotic presentation of material (e.g., Cherry 1953; Mowbray 1953; Moray 1959) were utilized to develop bottleneck theories of attention (e.g., Broadbent 1958; Treisman 1960; Norman 1968) – the feature common to all these bottleneck theories was the hypothesis of a filter stage in the system that could perceive only one stimulus at a time or initiate only one response at a time, thereby resulting in limited, and, therefore selective attention. Another set of theories, sometimes referred to as capacity models, have been developed (e.g., Kahneman 1973) which suggest that individuals have a limit on their capacity to carry out cognitive work and this limited capacity can be allocated freely among parallel tasks. Doing tasks simultaneously, in this view, is possible as long as the available capacity is not overwhelmed or exceeded. As Einstein suggests, this capacity constraint has implications and these theories help us understand the notion of divided attention.

Attention can be thought of as comprising three stages. The first is environmental scanning, wherein some attentional resources are deployed in search of objects in the environment of some significance. The second is attending to the object for the duration of the process wherein it remains significant. Finally, there is the cessation of attention. For instance, the gazelle needs to scan its environment for the presence of a predator. Once sighted, it will
need to attend to the predator/s for the duration of the chase. At the end of the chase, if the
gazelle has escaped, it will have to cease attending to the predator and search for other objects of
significance. Attentional resources appear to be flexibly allocated to these three stages. For
example, in the heat of the chase, presumably resources used for scanning the environment might
be redeployed towards the pursuing predator and thus the gazelle might not notice objects it
would otherwise have noticed (e.g., the leaves on a tree that could be eaten).

While considerable research has examined human attentional mechanisms in terms of
how we direct attention (see Pashler, Johnston and Ruthruff 2001 for a full review) and select
what to attend to, all the theories appear somewhat reticent about the third stage – how attention
is switched off. They recognize that attention to a particular stimulus may reduce or disappear
altogether due to a reallocation of processing capacity – in other words, one ceases attending to a
stimulus when some other stimulus overwhelms the first in its demand for attentional resources.
For instance, a gazelle attending to the leaves on a tree will stop attending to the leaves upon the
appearance of a predator. As the 19th century psychologist William James famously said,
“Everyone knows what attention is …it implies withdrawal from some things in order to deal
effectively with others” (James 1890).

To summarize, extant theories allow us to make predictions about the first two stages of
attention – what to attend to and continuing to attend to it for the duration required. The theories
make predictions such as divided and selective attention that have been tested under various
circumstances. However, the theories are relatively silent about the third stage – how one would
stop paying attention to a stimulus in the absence of another stimulus that wrenches our attention
from it.
Ceasing to Attend

“I am not absent-minded. It is the presence of mind that makes me unaware of everything else.” --- G. K. Chesterton

“Temperamentally anxious people can have a hard time staying motivated, period, because their intense focus on their worries distracts them from their goals.” --- Winifred Gallagher, Rapt: Attention and the focused life

We argue that one reason theories are silent about how one ceases to pay attention to a process (in the absence of a competing stimulus) is that such a mechanism may be absent. Many ecological patterns that we are programmed to attend to are relatively short processes, and thus we may not have evolved an automatic shut off. In other words, if there is a low risk or penalty for failing to switch off attention (which is plausible if most things being attended to are short run processes) or if there is no substantial benefit to switching off attention, there may be little evolutionary pressure to evolve a shut-off switch. In addition, it is usually more ecologically valuable to watch the process to the ‘end’ – the gazelle can’t stop attending to the pursuing lion until the lion stops chasing it. In other words, ecological considerations might have conspired to bias us in such a way that once we start attending to a process, we continue to attend to it until the ‘end’ of the process, regardless of whether that continued attention is warranted or not.

One way to test such a proposal would be to create situations where attention is unwarranted. However, that might be easier said than done. One reason we attend to train wrecks (of the physical kind as well as other kinds like social kinds) is because these grab attention – we attend to significant things. Commercials are particularly adept at refusing to stay in the background, arguably because they hijack these attentional circuits. It would require a narrow
definition of ‘normative’ to insist that such attentional hijacking is non-normative. Note also that our hypothesis is more focused - we contend that attention, once given (even warranted) cannot be shut off (even if the continued attention is no longer warranted).

We, therefore, select relatively ‘mundane’ processes. While continuing to attend to an ongoing mundane process may be perfectly valid in most of the environments we find ourselves in, often there are conditions where this is normatively difficult to justify. An ‘inability to switch off attention’ in such conditions would lend credence to our suggestion. We, hence, create manipulations at some point in the process that makes future attention clearly unnecessary. Specifically, we argue that if the results of the process are (reasonably) certain and there is nothing one can do to control or influence the process, further attention to the process is unwarranted and these attentional resources should be freed up so other things can be attended to. Our focal hypothesis is that, in the absence of a demand to reallocate attention, humans are biased to continue attending to the ongoing mundane process, even when that continued attention is unwarranted -- simply because we do not have an ‘off” switch from the current process, only a ‘reallocation’ algorithm. As the Chesterton and Gallagher quotes suggests, an inability to switch off attention can be useful (for example, in making us task-focused) but also potentially counter-productive.

We provide evidence for such an attentional bias and advance one consequence of the same in our work. In our studies, we set up conditions where individuals are a part of a mundane incomplete process – where they have taken all the required steps from their side to influence the completion of the process. Hence after some point in the process, there is nothing further for these individuals to do in order to control or affect the end of the process. Further, they have a reasonable degree of certainty about the outcome of the process, i.e., the outcome is known to as
great extent as is possible with nothing that individuals can do to increase their knowledge of what is going to happen. The normative response in such conditions would be to suspend attending to this incomplete process and transfer these attentional resources back to the central store for redeployment or environmental scanning. It has long been established in the literature that attentional resources are limited in capacity (Kahneman 1973; Scalf, Torralbo, Tapia & Beck 2013; Alvarez & Franconeri 2007). These limited attentional resources are critical for survival as they enable us to deal with the existing environment and determine whether any other stimulus in the environment warrants further attention (Baker & Brown 2014). From an ecological standpoint, it is useful to attend to many stimuli in the environment as these could signify an important opportunity that could be utilized for benefit, such as a prey, or an important threat that could be avoided for survival, such as a predator (Yantis & Hillstrom 1994). To this end, it appears likely that when attentional resources are tied up in attending to the mundane incomplete process, it is likely to be negatively hedonically marked, since we would rather dedicate the resources currently tied up with the incomplete task to other tasks like environment scanning, but are unable to. That is, given that there is nothing one can do to impact the completion of the process and its outcome, one would prefer to stop attending to it. However, given our previous argument, in the absence of another stimulus wrenching attention from this incomplete process, we do not have a way of ‘switching off’. In such a situation, we are thus doomed to attend to the incomplete process until it reaches its ‘end’, even though we would rather these attentional resources be made available for other tasks such as scanning the environment. This should create a fundamentally aversive state. In line with considerable research (Schwarz and Clore 1983, 1996, 2007), we would therefore argue that these hedonic marks are ripe for misattribution. In other words, we suggest that such a ‘perverse’ or
‘unwarranted’ chaining of attentional resources to the incomplete process produces a negatively
hedonically marked signal, which can be misattributed and manifest in the form of decreased
attitudes towards the entities associated with the process.

This might also be a good point to differentiate this work from superficially related work.
In widely cited work by Zeigarnik (1927), participants were interrupted while they performed
certain tasks such as solving a puzzle, creating clay figures or building a cardboard box.
Participants were interrupted when they appeared most engrossed in the task and were forced to
leave the task. Zeigarnik’s results showed that participants had a better memory later on for the
interrupted tasks when compared to the tasks they had finished without interruption. Zeigarnik
theorized that interrupting a person while they performed a task creates a quasi-need to finish it
thus causing the task to be retained in one’s memory. Baddeley (1963) made participants solve
multiple anagrams within a set time frame and would give the solution if they could not solve the
anagram in time. Baddeley (1963), in support of the Zeigarnik effect, found that participants
remembered the anagrams better when they were not able to solve them than when they were
able to solve them. In the Zeigarnik’s paradigm as well as the later replications carried out by
others (see Seifert & Patalano 1991 for a review), participants are interrupted in the performance
of a certain task. In other words, this has a superficial resemblance to the idea of an incomplete
process.

Note a key difference, however, between this and what we are proposing. The Zeigarnik
effect requires some additional input from the participant for the task to be completed. In our
paradigm, given the incomplete processes we set up, it is explicitly clear that there is nothing
further for the participant to do – they cannot influence or control the process. Moreover, as
mentioned earlier (and again different from the classic Zeigarnik paradigm), the outcome of such
processes is known to individuals with a reasonable degree of certainty. Our work makes the novel proposition that such incomplete processes which do not warrant our attention, do in fact chain our attentional resources. A second crucial difference is worth pointing out. The Zeigarnik effect points out that frustrating one’s own completion of a task (the independent variable) results in better memory (the dependent measure) for elements of that task. In our paradigm, even the completion of all of one’s responsibilities is insufficient to wrench our attention from a process set in motion by our actions, which in turn results in biased attitudes towards entities associated with the process.

It could be argued that what we are referring to as ‘incomplete process’ is really a frustration of goal attainment (Carver and Scheier, 1998, pg. 120, also, Moberly and Watkins, 2010). We argue that attention to an instrumental process (a means to an end) such as we use is arguably different from a goal (usually the end state one is interested in). If this were not the case, it would appear to become a semantic issue since both constructs appear to refer to a self-relevant incomplete process. To address this issue, we administer the TGP (tenacious goal pursuit) scale in Study 1C – if frustrating goal attainment were responsible for the focal phenomenon, we should expect this to be particularly pronounced for those high in TGP.

We start by demonstrating that incomplete processes have an ‘attitude biasing’ consequence in studies 1a, 1b and 1c, and to our knowledge, we are the first to demonstrate this phenomenon. We utilize a variety of domains to establish the robustness of this effect and operationalize ‘incompleteness’ in a variety of ways to provide some measure of triangulation. In study 2, we find evidence for our argument that this phenomenon is mediated by one’s inability to switch off attention from the process. In studies 3 & 4, we provide further evidence for our position that individuals continue attending to an incomplete process until it gets completed,
even when it is not warranted to do so. In study 5, we show that it is the negative hedonic marking of such unwarranted attentional chaining that results in the decreased attitudes towards associated entities. Finally, in study 6, we find further evidence that the incomplete process does in-fact chain one’s attentional resources, even when the outcome of the process is fully certain.

**STUDY 1A**

In study 1a, we used a context where participants had to imagine sending money to a friend in need using the services of a money transfer company – which had already sent the money to a point of collection from where the friend could pick up the money. We argue that the process is interpreted as ‘complete’ when the money is picked up by the friend at the point of collection. Therefore, we told some of the participants that their friend had collected the money, reasoning that these participants would code the process as complete and stop attending to it.

Alternatively, the same process was made ‘incomplete’ for some participants when the sent money was waiting at the point of collection, yet to be picked up by the friend who had not got off from work. Here, it is imperative to note that individuals have already sent the money and the money transfer company has safely transferred the amount to the point of collection as well. Individuals can thus assume with reasonable certainty that their friend would pick up the money at his convenience, before he needs it. Thus, although the process is incomplete, it clearly does not warrant any more of the individual’s attention since the outcome is reasonably certain and there is nothing more for the individual to do to affect it.¹ Yet, we argue that these individuals will be unable to stop attending to the process presumably until the friend physically picks up the money. In other words, some of their attentional resources will be chained to the process, a

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¹ We pretested these assumptions while designing our process incomplete/complete manipulations and provide the details in the methods section of this study.
chaining they would resent and this resentment would consequently bias their attitude towards the entities associated with the money transfer process.

In our experiment, the most convenient entity to which the felt hedonic state can be attributed is the money transfer company. We thus expect to see lower attitudes towards the money transfer company in the process-incomplete condition when compared to the process-complete condition.

In addition, we administered the need for closure scale since that provides an alternative account for our findings, namely that individuals high on need for closure would be more irritated by the incomplete process and it is need for closure, rather than the inability to withdraw attention, that drives the result.

**Method**

One hundred one undergraduate students enrolled at a major research university in the US participated in a single factor (process-incomplete Vs process-complete) between subjects study where participants had to imagine sending money to a friend in need. Participants were assigned to one of the two experimental conditions. Initially all participants irrespective of the experimental condition were asked to imagine being in the following situation: “Your good friend Drew working at Lowes in Utah has requested you to lend him some money ($100), which he needs after two days. You are sending him the money via a trusted online money transfer company named ‘Payo’. The money transfer company would transfer your funds instantaneously to a branch of a national pharmacy chain MedicAID, which is closest to your friend.” Participants were then asked to hit ‘Enter’ to initiate the money transfer.
Then, about half the participants (N=50), who were assigned to the ‘process-complete condition’ were told: “The money has reached the branch of the pharmacy chain and a representative has put a check for $100 in your friend’s PO Box. You and your friend have received the confirmation text message from the money transfer company as well. Your friend was already present at his house and he has collected the check from his PO Box”.

Alternatively, the remaining participants (N=51) who were assigned to the ‘process-incomplete condition’ were told: “The money has reached the branch of the pharmacy chain and a representative has put a check for $100 in your friend’s PO Box. You and your friend have received the confirmation text message from the money transfer company as well. Your friend is not at his house as he is busy at work and can’t get out now. He will collect the check from his PO Box later in the evening when he is back from work”. (While designing the process incomplete/complete conditions, we pre-tested the assumptions we had made while introducing the study. Please refer to the footnote below for details).

Then, the participants were asked to evaluate the money transfer company on two items (How much do you like this money transfer company; How likely are you to recommend this

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2 While designing the process incomplete/complete conditions, we first pre-tested the assumptions we had made while introducing the study that 1) individuals in the process-incomplete condition perceive the outcome to be as certain as those in the process-complete condition. In this regard, we did a pre-test with a separate set of participants where, after being exposed to the manipulations, individuals in both conditions responded on a three-item ten-point (1 – least certain; 10 – most certain) scale (Items: How confident are you about this money transfer process in general; How certain are you about this money transfer process; How certain are you that your friend will be able to use the sent money in time). Individuals were equally certain about the outcome in both the conditions (MIncomplete = 7.01 Vs MComplete = 6.64; F(1, 58) = .294; p = .590; n_p^2 = .005).

2) The second assumption we pre-tested was that individuals, in both process incomplete/complete conditions, have nothing more to do to influence the outcome. A second pre-test was done with a separate set of participants where, after being exposed to the manipulations, individuals in both conditions responded on a two-item seven-point scale (-3 – strongly disagree to +3 – strongly agree; items: ‘How much do you agree with the following statement: 1) As a sender, there is nothing more for you to do now with respect to this money transfer process; 2) You have already done the needful from your side with respect to the money transfer process’). The responses did not differ between the two conditions (MIncomplete = 1.97 Vs MComplete = 1.94; F(1, 69) = .014; p = .906; n_p^2 = .000).
money transfer company to others) on a slider scale from 0 (not at all) to 100 (to a large extent). We had conducted a pre-test to address uncertainty. However, one can still argue that in the process-incomplete condition, there is an element of uncertainty with respect to the outcome and it is this aversion to uncertainty (i.e., a need for closure) which is driving the proposed decrease in attitudes. Need for Closure describes an individual’s desire for a firm answer to a question and an aversion toward ambiguity (Kruglanski & Webster 1996). We address this in two ways. In our paradigm, we make the outcome aware to participants in the process-incomplete condition, to as great an extent as is possible. For instance, in the current study, the sent money is put in the friend’s PO-Box (point of collection closest to the friend). However, an incomplete process by its virtue will always have a small degree of uncertainty. For this reason, we administered the 15-item Need For Closure (NFC, Roets & Van Hiel 2011) scale which participants completed before exiting the current study. If aversion to uncertainty is driving the proposed decrease in attitudes, then individuals with a high need for closure should penalize the associated entity (in this case the money transfer company) more when compared to those individuals who have a lower need for closure. Hence if the need for closure argument is true, then we should find our focal effect to be moderated by individuals’ responses on the need for closure scale.

Analysis and Results

We ran a single factor ANOVA, taking the attitude towards the money transfer company, i.e., mean of the responses on the two attitude items (α = .950) as the dependent variable. Analysis revealed that as expected, participants in the ‘process-incomplete condition’ had significantly lower attitudes towards the money transfer company when compared to those who
were in the ‘process-complete condition’ \( (M_{\text{Incomplete}} = 64.90 \text{ Vs } M_{\text{Complete}} = 76.82; F(1, 99) = 6.168; p = .015; n_p^2 = .059; \text{ cohen’s } f = 0.25)\).

A sensitivity power analysis (Faul, Erdfelder, Lang, Buchner 2007) revealed that on the basis of the means, alpha significance criterion of .05 (two-tailed), and a standard power criterion (80%), a sample of one hundred and one would result in statistical power of cohen’s \( f = 0.28\).

Regression analysis revealed that this focal effect was not moderated by participants’ NFC score (Std. \( \beta = .240; t(98) = .781; p = .437\)). Thus, we can infer that the focal effect demonstrated here is not due to need for closure/aversion towards uncertainty. It can be argued that individuals penalized the money transfer company in the process-incomplete condition as they may have perceived the company to be incompetent for not handing the cheque personally to the friend or for any other possible error from the company’s side. We ran a test with a separate set of participants in an effort to remove this alternate explanation. Please refer to the footnote below for details.\(^3\)

**Summary**

The results demonstrate our proposed phenomenon in the context of a money transfer scenario. We find that individuals had lower attitudes towards the money transfer company when

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\(^3\) It can be argued that individuals penalized the money transfer company in the process-incomplete condition as they may have perceived the company to be incompetent for not handing the cheque personally to the friend or for any other possible error from the company’s side. We ran a test with a separate set of participants in an effort to remove this alternate explanation. After being exposed to the manipulations, individuals in both conditions were asked “How likely are you to blame the money transfer company if your friend forgets to pick the cheque from his POBox in time” (For the complete group the question was worded as “How likely were you to blame the money transfer company if your friend had forgotten to pick the cheque from his POBox in time”) (seven-point scale: 1 – not likely to blame, 7 – likely to blame). Results indicated that individuals did not blame the company as the responses were skewed towards ‘1’ \( (M_{\text{Incomplete}} = 1.97 \text{ Vs } M_{\text{Complete}} = 2.31)\). Also, the responses to the question did not differ significantly between the two conditions \( (F(1, 69) = .741; p = .392; n_p^2 = .011)\). In addition, we asked individuals in both conditions, “How likely is it that such money transfers are not successful due to an error on the part of the money transfer company”. Individuals’ responses did not differ between the two conditions \( (M_{\text{Incomplete}} = 3.97 \text{ Vs } M_{\text{Complete}} = 4.22; F(1, 69) = .416; p = .521; n_p^2 = .006)\). Responses to both the questions help us remove the
the process of ‘sending’ money to the friend was incomplete than when it was complete. An
important consideration is that there is no normative reason for the attitude towards the money
transfer company being lower in the process-incomplete condition, as the company had done its
job appropriately by safely transferring the money to the friend’s mailbox (point of collection
closest to friend) and picking up the money from there was entirely up to the friend.

In Study 1b and 1c, we sought to demonstrate the robustness of this phenomenon in
contexts other than transferring money.

**STUDY 1B**

In study 1b, we use a choice construction task where participants were customizing a car
and had to choose options they wanted. In the case where the customization process was
‘complete’, individuals were intimated that the company had a finished car that matched the
customization desired by the customer and that the car could be collected the next day from the
facility. In the case where the same process was ‘incomplete’, individuals were told that the
company had a car that needed the addition of one component to meet the customer’s
customization requirement. This component would be fitted and the car could be collected the
next day from the facility.

Note that in both conditions, the outcome of the customization process was identical as
individuals would ultimately receive the car as per their chosen configuration *in the same time
period of one day* – (unlike study 1a, the time period for the outcome was kept constant in both
process-complete and incomplete conditions). The only difference was that in the latter case,
one of the chosen components was not a part of the car at that specific point in time and would

possibility that our process incomplete/complete manipulation does not alter individuals’ perception of
competency of the money transfer company.
be installed in the interim period, consequently rendering the customization process incomplete at that point in time.

Accordingly, in line with our predictions earlier, we hypothesize that individuals’ attitude towards the entities associated with the car (the car company) would be lower when the customization process was incomplete than when the same process was complete.

We had conducted the required pre-test to address uncertainty. In addition, we also administered the 15-item need for closure scale at the end of the current study to reinvestigate whether need for closure, i.e., an aversion to uncertainty, influences the impact of incomplete versus complete process manipulation on attitudes.

**Method**

One hundred and one Amazon Mechanical Turk users from the U.S. participated in this choice construction task for monetary compensation. Individuals were asked to imagine buying a car from a company which gives them the opportunity to customize their car. All individuals started from a base model for the car but they could choose features to add over and above it as per their preferences. Participants were then shown different options along with the additional cost for each option. Participants chose the body color from five different options (such as Metallic Red for $700 extra, Saphire Blue for $500 extra), interior color from five different options (such as Black Dacota for $500 extra, Oyster for $500 extra), and wheels and tire of their choice from two options (18” Light alloy wheels double-spoke 384 with mixed performance tires or 18” Lt/Aly wheels Double-spoke 384 w/ All Season tires). Then, participants could choose to add additional components such as Xenon headlights, rear view camera etc. One of the optional additional components, a built-in navigation system, was critical for our study, as participants
were randomly divided into two experimental conditions if they had opted for this component. Participants could choose to add the built in navigation system for an additional $300.

Participants who had decided to include the built in navigation system in their customized car were randomly assigned to one of two conditions: customization-complete condition and customization-incomplete condition. Participants in the customization-complete condition were told: “We have cars that match your desired configuration and you can collect your car from our facility tomorrow”. Alternatively, participants in the customization incomplete-condition were told: “We have cars that almost match your configuration. This is because the built-in navigation system is not installed in the car right now. We will install the navigation system and you can collect your car from our facility tomorrow”. (While designing the customization
incomplete/complete conditions, we conducted the relevant pre-tests. Please refer to the footnote below for details.)

Then, the participants were asked to evaluate the car company on two items (How much do you like this car company; How likely are you to recommend this car company to others) on a slider scale from 0 (not at all) to 100 (to a large extent).

Participants who had not opted for the built-in navigation were not assigned to any condition and were simply asked for the evaluations of the car company.

Participants then completed the 15-item Need For Closure (NFC) scale before exiting the study (Roets & Van Hiel 2011).

Analysis and Results

Sixty-one participants opted for the navigation system whereas forty did not. The mean attitude towards the car company as measured by responses on the two items ($\alpha = .915$) used to

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4 While designing the process incomplete/complete conditions, we pre-tested for the following:

1) individuals in the process-incomplete condition are as certain as those in the process-complete condition with respect to the installation of the navigation system in their car as well as the delivery of the car. In this regard, we did a pre-test with a separate set of participants where, after being exposed to the manipulations, individuals in both conditions responded on two questions (1 – least certain; 10 – most certain; Items: How confident are you that the company installs the navigation system in its cars properly; How certain are you that the car will be ready for collecting in a day as specified by the company). Individuals were equally certain in both the conditions with respect to the installation of the navigation system ($M_{incomplete} = 7.66$ Vs $M_{complete} = 7.67$ $F(1, 54) = .000; p = .984; n^2 = .000$) as well as the delivery of the car ($M_{incomplete} = 7.03$ Vs $M_{complete} = 6.30; F(1, 54) = 1.122; p = .294; n^2 = .020$).

2) The second assumption we pre-tested was that individuals, in both process incomplete/complete conditions, have nothing more to do to with respect to the assembly of their car. Individuals in both conditions responded on a two-item seven-point scale (-3 – strongly disagree to +3 – strongly agree; Items: ‘How much do you agree with the following statement: 1) You have already done the needful from your side with respect to the assembly of your car; 2) There is nothing more for you to do now with respect to the assembly of your car). The responses did not differ between the two conditions ($M_{incomplete} = 1.83$ Vs $M_{complete} = 1.72; F(1, 54) = .141; p = .709; n^2 = .003$). Also, we had asked individuals in both conditions about their perceived control over the installation of the navigation system (1 – no control to 7 – most control; How much control do you think you have over the installation procedure of the navigation system in your car) and found no differences ($M_{incomplete} = 3.78$ Vs $M_{complete} = 3.48; F(1, 54) = .567; p = .455; n^2 = .010$).
evaluate the car company was the dependent variable. A single factor ANOVA was run only for the participants who had opted for the navigation system in order to check for the differences in attitude towards the car company, between participants who were assigned to the customization-complete condition (N=31) and those who were assigned to the customization-incomplete condition (N=30). Analysis revealed that as expected, participants in the customization-incomplete condition reported significantly lower attitudes towards the car company when compared to those in the customization-complete condition (M_{Incomplete} = 65.56 Vs M_{Complete} = 77.71; F(1,59) = 5.350; p = 0.024; n_p^2 = .083; cohen’s f = 0.30).

A sensitivity power analysis (Faul, Erdfelder, Lang, Buchner 2007) revealed that on the basis of the means, alpha significance criterion of .05 (two-tailed), and a standard power criterion (80%), a sample of sixty-one would result in statistical power of cohen’s f = 0.37.

Once again, regression analysis revealed that this focal effect was not moderated by participants’ NFC score (Std. β = -.210; t(58) = -.553; p = .582). Thus we can infer that the focal effect demonstrated here is not due to need for closure.

Summary

Study 1b demonstrated the proposed phenomenon in a different context. It is interesting to note that in both the conditions, individuals receive their desired customized car in the same time period of one day, inclusive of the optional component that was lacking earlier in the incomplete condition (and of course was lacking at some point in time in the past for the complete car as well). As the outcome of the customization process is the same in both conditions, thus normatively there should be no differences in attitude towards the company. Our theorizing has suggested that at the time of evaluating the car company, the optional component
being uninstalled in the incomplete condition resulted in individuals’ being unable to shut off attention to the customization process. This inability to turn off attention, being hedonically marked, manifests itself in the form of lower attitudes towards the car company.

**STUDY 1C**

Continuing the effort to establish the robustness of this phenomenon and obtain some triangulation, Study 1c utilized a different scenario again. The context used in study 1c was the use of gift cards. In this study, individuals had to choose a gift for their friend where they could choose either a gift card or a product from a couple of available options, as the gift. We can thus define the process as “giving a gift to your friend”.

We argue that when individuals gift a product to their friend, they interpret the gifting process to be ‘complete’, as they have given a tangible item as the gift. Accordingly, these individuals stop attending to the process as they perceive it to be complete.

On the other hand, when individuals give a gift card to their friend, they might interpret the same gifting process to be ‘incomplete’ as their friend is yet to buy something s/he likes with the gift card. It can be noted that by giving the gift card, individuals have already done their bit in terms of giving a ‘gift’ and can do nothing further to impact when and what their friend buys with the gift card. They can just assume with reasonable certainty that their friend will buy something s/he likes with the received gift card -- the gifting process clearly does not warrant any more of their attention. Yet, we argue that some of their attentional resources will still be chained to the gifting process, a chaining they would resent and this resentment would consequently bias their attitude towards the entities associated with the gift card.
In our experiment, the most convenient entity to which the felt hedonic state can be attributed is the store from where the gift, be it a product or a gift card, is chosen. Thus, we hypothesize that the attitude towards the store from where the gift is chosen will be significantly lower when the gift given is a gift card when compared to the case where the gift given is a product.

Method

One hundred and fifty Amazon Mechanical Turk users from the U.S. participated in this study for monetary compensation. They were asked to imagine a scenario in which they had to choose a birthday gift for their friend. Specifically, they were told – “It is your friend's birthday next week and you are considering buying a gift for your friend. Your friend likes to play the guitar. You are considering buying a gift from one of two guitar stores: Rainbow Place or Sunshine Mart. Both these stores sell all guitar accessories. You can purchase a gift from the following options. You are thinking of giving your friend a gift worth $20. All items shown on the next page are worth $20. Please select the option which you want to gift to your friend. The gift will be directly mailed to him/her”. Then participants were shown the various options, as shown in Figure 1, from which they could choose the gift. We counterbalanced the position of the options i.e. half the participants saw options from The Rainbow Place on the top and those from The Sunshine Mart at the bottom. The other half saw options from The Sunshine Mart at the top and those from The Rainbow Place at the bottom.

Once participants had chosen a gift, they performed a word search task that served as a buffer to induce a time delay. After completing the word search task, participants were asked to
imagine that their friend had received the gift that they had chosen. Then, participants were asked for their attitude towards the store from which they had chosen the gift using a four-item (bad-good; unfavorable-favorable; unpleasant-pleasant; negative-positive) 9-point (from 1 to 9) Likert type scale to record participants’ attitudes towards the store.

Participants then filled the 15-item Need For Closure (NFC) scale (like in studies 1a and 1b). In addition, we administered the TGP (Tenacious Goal Pursuit) scale (Brandtstadter and Renner 1990). It can be argued that individuals who give the gift card have their attention chained to the gifting process as they are still engaged in ‘pursuing’ a goal. If this is true, individuals with a higher goal pursuit trait should penalize the associated entity more when compared to those who have a lower goal pursuit trait, and we should find our focal effect to be moderated by the individual level trait of goal pursuit.

Just before the end of study, we asked participants who had chosen the gift card the reason for doing so. The options, drafted based on a pre-study, were ‘I chose the gift card so that my friend can buy anything s/he wants with it’; ‘I had a gift in my mind but it was not in the options - so, I bought the gift card’, and, ‘Any other reason (mention below)’.

**Analysis and Results**

Participants’ mean attitude on the four-item scale ($\alpha = 0.969$) towards the store from where they had chosen the gift (i.e. attitude towards The Rainbow Place if the gift was chosen from The Rainbow Place and that towards The Sunshine Mart if the gift was chosen from The Sunshine Mart) was the dependent variable.

A single factor ANOVA was run to check for differences in attitude towards the store from which the gift was chosen, between the participants who had given a gift card and those
who had given a product (i.e., pick or strap). Analysis revealed that as expected, the attitude towards the store was significantly lower when participants gave a ‘gift card’ when compared to the case where participants gave a ‘product’. (M\text{attitude\_chosen \ store\_gift card} = 2.165 \text{Vs } M\text{attitude\_chosen \ store\_product} = 2.947; F(1,148) = 12.438; p = 0.001; n_p^2 = .078; \text{cohen’s } f = 0.29). Note that the store was penalized subsequent to a freely expressed preference for a gift card – a pattern difficult to defend normatively and suggestive of our inability to anticipate the attentional chaining that we argue results from the choice of the gift card.

A sensitivity power analysis (Faul, Erdfelder, Lang, Buchner 2007) revealed that on the basis of the means, alpha significance criterion of .05 (two-tailed), and a standard power criterion (80%), a sample of one hundred and fifty would result in statistical power of cohen’s f = 0.23.

Similar to the two previous demonstrations, a regression analysis revealed that participants’ NFC score did not moderate the focal effect of giving gift-card/product (process-incomplete/process-complete) on attitudes towards the store (Std. $\beta = .148; t(147) = 1.543; p = .125$). The TGP scores also did not moderate this focal effect (Std. $\beta = .469; t(147) = 0.908; p = .365$). We can thus infer that focal effect demonstrated here is not due to need for closure or goal pursuit.

Upon analyzing the reasons participants gave for selecting the chosen gift card, we found that all but two participants chose the option which said that they chose the gift card so that their friend could buy a product of his/her own liking. One participant chose the option which indicated that the participant had a product in his/her mind which the store didn’t have, and thus chose the gift card. One participant chose ‘some other reason’. The responses to this question indicate that participants who had chosen the gift card did not penalize the store for not carrying
a gift they might have had in their mind for their friend – hence we account for this alternate explanation.

To ensure the phenomenon is reasonably robust to context, we ran a similar study where participants had to choose a wedding gift for their friend. Participants could choose a gift from two stores and had to choose from bottles of perfume, a vacuum cleaner and a gift card at each store. We obtained similar results in that participants who had chosen a gift card reported lower attitudes towards the store when compared to those who had chosen a gift other than the gift card (N = 144; M_{attitude\_chosen\_store\_gift\_card} = 1.32 Vs M_{attitude\_chosen\_store\_product} = 1.96; F(1,142) = 4.568; p = 0.034; n_p^2 = .031; cohen’s f = 0.18).

**Summary**

We have suggested that the above difference in attitudes is due to the fact that individuals who have given a gift card code the gifting process to be ‘incomplete’ as their friend is yet to buy something in exchange of the gift card, and, thus some of their attention is still chained to the gifting process. This is negatively marked in hedonic terms, leading to a decreased attitude towards the store from which the gift card was chosen.

**DISCUSSION OF DEMONSTRATION STUDIES**

With the help of the three studies, we have demonstrated our basic ‘attitude biasing’ phenomenon across different consumption contexts. In each of the studies 1a, 1b and 1c, in the absence of a demand to reallocate attention, we propose that individuals continue attending to an ongoing mundane process till its conclusion, in spite of the process not warranting one’s attention. Such an inability to switch off attention from the incomplete process creates a negative hedonic marking which manifests in the form of the decreased attitudes towards entities
associated with the process – as observed in studies 1a, 1b & 1c. Note that these results do not appear to be explained by other accounts based on constructs such as need for closure (i.e., an aversion to uncertainty) or goal pursuit. However, evidence in support of our account based on an inability to switch off attention leading to a negative hedonic marking, and consequently leading to the negative attitudes, is still required and is the focus of the remaining studies.

**Unwarranted chaining of attention as the mediator**

The key proposition we are making in our process account is the notion that individuals are unable to stop attending to an incomplete process till it reaches its ‘end’, in spite of the process not warranting one’s attention. Thus in Study 2, we seek to demonstrate 1) individuals’ inability to switch off attention from an incomplete process (that cannot be affected or impacted by that attention), and, 2) that such a perverse chaining of attention to the process mediates the negative influence of the incomplete process on the attitudes towards associated entities.

In order to verify whether available attentional resources are depleted, on account of part of them being captured by an incomplete process, we can look at individuals’ performance in an unrelated visual search task that measures selective attention --- selective attention is the ability to focus on some particular task while disregarding other distracting information (Tsal, Shalev & Mevorach 2005). A visual search task typically requires one’s attention for scanning the visual environment to locate a ‘target’ among multiple other objects (Treisman & Gelade 1980). Thus according to our proposition, if an ‘incomplete process’ does in fact capture one’s attention, then the attentional resources available for undertaking the visual search task would be lower consequently hampering performance on the task. However, a ‘completed process’ on the other hand should result in the attentional resources being returned to the ‘central store’ and therefore available for the visual search task. In other words, if individuals’ attention is captured by an
incomplete process, then the performance on a subsequent but seemingly unrelated visual search task that measures selective attention should be significantly lower than the performance of those individuals for whom the process is complete. Such a pattern of results would support our focal contention that incomplete processes capture attention (albeit unwarranted). In study 2, we use a ‘Conjunction Search task’, which is a specific type of visual search task, to measure individuals’ selective attention (Treisman & Gelade 1980).

In a Conjunction search task, individuals have to look for a target object among multiple distractor objects, where the target is characterized by a specific conjunction of shape and color (Tsai et al 2005). To elucidate, the target object shares one visual property, such as shape, with one kind of distractor and a second visual property, such as color, with the second kind of distractor. For example, in one of our conjunction search tasks, individuals had to visually search for a red circle (target) among blue circles (first kind of distractors) and red squares (second kind of distractors). Note that the target, the red circle, shared one visual property, the shape, with the

5 Please note that we use our ‘switch off’ terminology as our theoretical conceptualization is that - we continue attending to an incomplete process until it ends, in the absence of a competing stimulus that wrenches our attention away from it (as in studies 1a, 1b, 1c where individuals attend to a single process, which is either complete or incomplete, and there is no other competing stimulus). However, in order to provide evidence for this attention chaining to the incomplete process, we need to use the conjunction search task - an established measure for attention. The purpose of using the conjunction search task is to provide a measure for attention being chained to the money remittance process participants saw earlier. However, one can view the conjunction search task as a ‘competing’ stimulus. In this case, our use of ‘switch-off attention’ can erroneously reflect that we are assuming that all our attention can either be given to process 1 (the money remittance process) or process 2 (the conjunction search task). We would like to clarify that we assume, in line with capacity models (e.g., Kahneman 1973), that attentional resources will get shared by the two processes here. In other words, we do not expect that all our attention will be completely switched off from one process and move to another process. Rather, we expect, in line with the task switching literature (Jersild 1927), that our attentional resources will be shared by the two processes and shift between them. Even in such a paradigm, our position that the incomplete process, just by virtue of being incomplete, will occupy our attentional resources will hold true. Given that the incomplete money remittance process does not warrant any more attention, a good amount of our available attentional resources should be paid to the conjunction search task. However, if the incomplete money remittance process occupies some amount of our available attentional resources, then the conjunction search task will not be given as much attention as it should have been given. Hence the performance in the conjunction search task will provide a measure for the amount of attention being taken up by the incomplete money remittance process.
first kind of distractors, and the second visual property, the color, with the second kind of
distractors. A poor performance in such a conjunction search task is depicted by increased time
latencies to successfully locate the target object among the distractors.

**STUDY 2**

In study 2, we used the same money transfer context used in study 1a. We used the
context where participants had to imagine sending money to a friend in need using the services
of a money transfer company – which had already sent the money to a point of collection from
where the friend could pick up the money. Similar to study 1a, in the process-complete
condition, participants were told that their friend had collected the money.

Alternatively, in the process-incomplete condition, participants were told that the sent
money was waiting at the point of collection, yet to be picked up by the friend who had not got
off from work. We argued, in the introduction of study 1a, that these individuals will be unable
to stop attending to the process, in spite of the process not warranting anymore of their attention
– presumably until the friend physically picks up the money. Consequently, these individuals
should perform poorly in a subsequent but unrelated task requiring attentional resources (the
conjunction search task) and thereby take significantly more time to locate the target object
among the distractors, when compared to those individuals for whom the process was complete.
Hence, by measuring performance in the conjunction search task, we provide evidence for
attention chaining to the incomplete process.

More importantly, we show that this attention chaining mediates the negative influence of
the incomplete process on the attitudes towards the entities associated with the process, in this
case the money transfer company.
Methods

One hundred and seventy students enrolled at a major research university in the US participated in a single factor (process-incomplete Vs process-complete) between subjects study which was run on E-prime software. We first gave all participants the same cover story as study 1a: “Your good friend Drew working at Lowes in Utah has requested you to lend him some money ($100), which he needs after two days. You are sending him the money via a trusted online money transfer company named 'Payo'. The money transfer company would transfer your funds instantaneously to a branch of a national pharmacy chain MedicAID, which is closest to your friend.” Participants were then asked to hit ‘Enter’ to initiate the money transfer.

The process complete-incomplete manipulation was identical to the one used in study 1a. About half the participants (N=89), who were assigned to the ‘process-complete condition’ were told: “The money has reached the branch of the pharmacy chain and a representative has put a check for $100 in your friend’s PO Box. You and your friend have received the confirmation text message from the money transfer company as well. Your friend was already present at his house and he has collected the check from his PO Box”.

Alternatively, the remaining participants (N=81) who were assigned to the ‘process-incomplete condition’ were told: “The money has reached the branch of the pharmacy chain and a representative has put a check for $100 in your friend’s PO Box. You and your friend have received the confirmation text message from the money transfer company as well. Your friend is
not at his house as he is busy at work and can’t get out now. He will collect the check from his PO Box later in the evening when he is back from work”.

Next, participants undertook a conjunction search task which is used as a measure of selective attention. Participants were told that they would be doing a speed task that involves 10 trials. In each trial, participants had to look for a red circle among a collection of many red squares and blue circles appearing above and below a center line on the screen. Please see Figure 2 for an example of a trial screen. Essentially, in each trial, participants were asked to figure out as quickly as possible if the red circle appeared below the center line or above the center line and respond appropriately by hitting the designated key on the key board. Participants were told to be as quick and accurate as possible. They were told to put their left and right index fingers on the two designated keys on the key board before the task started. Performance on the conjunction search task is measured by the time latency to successfully locate the red circle among the red squares and blue circles, which serve as the distractors.

<Insert Figure 2 About Here>

Finally, all participants were asked to evaluate the money transfer company on three items (How much do you like Payo; How good do you feel about Payo; How favorable do you feel about Payo) on a scale from 0 (not at all) to 9 (a lot).

Analysis and Results

Chaining of Attention

Participants’ response times (i.e. the time taken to locate the red circle) for the trials of the conjunction search task were used for analysis. There were 1700 responses (each of the 170 participants had ten responses for the conjunction search task). Only correct responses were
included in the analysis. Further, responses which were above 10 seconds and below 400 milliseconds were not recorded to avoid outliers due to errors such as double key presses. Hence, in total 166 data points out of 1700 responses were incorrect or were not recorded (9.76% data loss). The loss of data was insignificantly different in the two conditions (p > .1). Response times were log transformed.

The average response latency of each participant across the trials of the conjunction search task served as the dependent variable. Analysis revealed that participants in the ‘process-incomplete condition’ had significantly higher response times for successfully locating the red circle among the distractors, when compared to those participants who were in the ‘process-complete condition’ (M_{Incomplete\_LN\_Transformed} = 7.68 vs. M_{Complete\_LN\_Transformed} = 7.56, F(1, 168) = 5.704; p = .018; n_p^2 = .033; cohen’s f = 0.19).

A sensitivity power analysis (Faul, Erdfelder, Lang, Buchner 2007) revealed that on the basis of the means, alpha significance criterion of .05 (two-tailed), and a standard power criterion (80%), a sample of one hundred and seventy would result in statistical power of cohen’s f = 0.22.

Attitudes

We ran a single factor ANOVA, taking the attitude towards the money transfer company, i.e., mean of the responses on the three attitude items (α = .944) as the dependent variable. Analysis revealed that as expected and similar to study 1a, participants in the ‘process-incomplete condition’ had significantly lower attitudes towards the money transfer company when compared to those who were in the ‘process-complete condition’ (M_{Incomplete} = 5.617 Vs M_{Complete} = 6.315; F(1, 168) = 5.429; p = .021; n_p^2 = .031; cohen’s f = 0.18).
A sensitivity power analysis (Faul, Erdfelder, Lang, Buchner 2007) revealed that on the basis of the means, alpha significance criterion of .05 (two-tailed), and a standard power criterion (80%), a sample of one hundred and one would result in statistical power of Cohen’s $f = 0.22$.

**Mediation**

Regression analysis was used to investigate the hypothesis that *attention chaining* mediates the effect of *process incompleteness/completion* on *attitude*. Results indicated that process incompleteness/completion was a significant predictor of attention chaining ($b = .121, SE = .051, p = .018$) as well as of attitude ($b = -0.702, SE = .151, p = .021$), and, that attention chaining was a significant predictor of attitude ($b = -2.086, SE = .035, p < .001$). Process incompleteness/completion was no longer a significant predictor of attitude after controlling for the mediator, i.e., attention chaining ($b = -0.448, SE = .287, p = .121$) – consistent with full mediation. 38.8% of the variance in attitude was accounted for by the predictors ($R^2 = .388$). The indirect effect was tested using a bootstrap estimation approach with 5000 samples. These results indicated the indirect coefficient was significant ($b = -0.253, SE = .120, p = .035$).

<Insert Figure 3 About Here>

**Summary**

The results of Study 2 support our contention that individuals are indeed unable to switch off their attention from the incomplete process. Individuals in the incomplete condition, where the friend was yet to pick up the money from his P.O. Box, were apparently unable to suspend attending to the process, and, consequently performed poorly (higher response times to locate red circle) on the attention measuring conjunction search task. Such a chaining of attention was clearly unwarranted as the outcome was reasonably certain and there was nothing more for
individuals to do to affect it (the pre-tests done in study 1a for the same money transfer scenario substantiate our position).

The results of Study 2 demonstrate that an incomplete process captures individuals’ attentional resources, even when it was not normative to do so. If our thesis is true, these captured attentional resources should be released when the same process that was incomplete earlier now gets completed. Thus in Study 3, we seek to provide additional support for our position that attention tends to be ballistic – that is, individuals are in fact unable to stop attending to an incomplete process, until it gets completed. We do this by investigating whether the captured attentional resources get released when a process, that was incomplete earlier, is now made complete.

STUDY 3

In study 3, we used a scenario in which individuals would receive a coupon from a restaurant of their choice, as a token of appreciation for their participation in an unrelated experiment. After choosing the kind of coupon they wanted, individuals were informed that they would receive their coupon which could be used at the restaurant. In the case where the process was ‘complete’, individuals were informed that the coupon had been emailed to them.

Alternatively, in the case where the same process was ‘incomplete’, individuals were informed that the coupon would be emailed to them a day after. It can be noted that these individuals have already indicated the kind of coupon they want and can do nothing more to influence when the coupon will actually be emailed to them. Clearly, even though the coupon has not been received yet, the situation does not warrant any more of the individual’s attention. Yet, we argue that these individuals are unable to switch off, i.e., their attentional resources will still be chained to this process of ‘receiving the coupon’ until it is actually emailed to them.
Consequently, these individuals should perform poorly in a subsequent but unrelated task requiring attentional resources (the conjunction search task) and thereby take significantly more time to locate the target object among the distractors, when compared to those individuals for whom the process was complete (i.e. those who were emailed the coupon instantaneously).

If our argument is true, the chained attentional resources in the incomplete process should be released when the process is made complete. At a later point in the experiment, individuals who were not emailed the coupon earlier, received it as promised, thus making the process complete. Subsequently all participants then undertook a second conjunction search task. Essentially, we predict that individuals who were not emailed the coupon immediately and thus had their attention captured in the process of receiving it, would perform poorly on the first conjunction search task when compared to those individuals who received the coupon immediately. After receiving the promised coupon, these captured attentional resources should now be released, consequently improving these individuals’ performance in the second conjunction search task. As a result, the difference in performance observed on the first attention task between those individuals for whom the process was incomplete and those for whom it was complete, should now get nullified in the second attention task.

Methods

One hundred and fifty undergraduate students enrolled at a major research university in the US participated in a single factor (process-incomplete Vs process-complete) between subjects study which was run on E-prime software. All participants were told that we would be giving them a restaurant coupon as a token of appreciation for their participation in the study. They were told that we had partnered with DealsIC, a company that supposedly provided online deals and coupons for local restaurants. They could choose a restaurant from six options, all
within walking distance of the university. Then, they could choose the kind of coupon they wanted from four different options (such as (1) Buy 1 food item/drink, get 1 at 50% off; (2) $5 off on a purchase of $20 etc.).

About half the participants, who were assigned to the ‘process-complete’ condition were told “DealsIC has already emailed your preferred coupon to your university email ID”. Alternatively, the remaining participants, who were assigned to the ‘process-incomplete’ condition were informed that “DealsIC will email your preferred coupon to your university email ID tomorrow”.

Next, participants undertook the conjunction search task we had administered in study 2. Please see Figure 2 for an example of a trial screen. Participants had to look for a red circle among a collection of many red squares and blue circles appearing above and below a center line on the screen. In each trial, participants were asked to figure out as quickly as possible if the red circle appeared below the center line or above the center line and respond appropriately by hitting the designated key on the key board. In all, there were ten trials of the task.

After all participants had finished this first conjunction search task, those participants in the ‘process-incomplete’ condition, were now informed that the coupon had actually been emailed to them, thus making the process complete for them as well. They were told “Instead of tomorrow, as per the recent confirmation from DealsIC, your coupon has already been emailed to your university ID”. Alternatively, participants in the ‘process-complete condition’, who were already emailed the coupon instantaneously, were just reminded of the email again. They were told “This is to reconfirm that DealsIC has already emailed your preferred coupon to your university email ID”.

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Next all participants were told that they would be doing another speed task that involved 10 trials. This speed task was a variant of the conjunction search task participants had done earlier to measure individuals’ selective attention. In each trial, participants had to look for a black ‘T’ among a collection of many black ‘X’s and gold ‘T’s appearing on either side of a vertical central line on the screen. Please see Figure 4 for an example of the trial screen. Essentially, in each trial, participants were asked to figure out as quickly as possible if the black ‘T’ appeared on the left or right side of the vertical central line and respond appropriately by hitting the designated key on the keyboard.

<Insert Figure 4 About Here>

**Analysis and Results**

Participants’ response times across trials of the conjunction search tasks were used for the analysis. Only correct responses were included in the analysis. There were 3000 total responses (each of the 150 participants had ten responses for the first CS task and ten responses for the second CS task) and 159 of these responses were incorrect (5.3%). The loss of data due to incorrect responses was insignificantly different across the two conditions (p > .1). Response times were log transformed.

The average response latency of each participant across the trials served as the dependent variable. A mixed design ANOVA with condition (process-complete vs. process-incomplete) and conjunction search task (first vs. second) as the factors revealed a significant main effect of the conjunction search task since participants were quicker in the first task than the second (\(M_{\text{first\_task\_Ln\_Transformed}} = 7.69\) vs \(M_{\text{second\_task\_LN\_Transformed}} = 7.86\); \(F(1, 148) = 38.792; p < .001; \eta^2_p = .208;\) cohen’s \(f = 0.51\)). The main effect of condition was marginally significant.
(M\textsubscript{Incomplete LN_Transformed} = 7.818 vs. M\textsubscript{Complete LN_Transformed} = 7.733, F(1, 148) = 3.590; p = .060; \(n_p^2 = .024\); cohen’s f = 0.16). The effects were qualified by a two-way condition X conjunction search task interaction (F(1, 148) = 3.651; p = .058; \(n_p^2 = .024\); cohen’s f = 0.16). Further analyses, which was central to our hypotheses, revealed that, as predicted, on the first conjunction search task, participants in the ‘process-incomplete’ condition had significantly higher response times to successfully locate the target object compared to those in the ‘process-complete’ condition (M\textsubscript{Incomplete LN_Transformed} = 7.755 vs. M\textsubscript{Complete LN_Transformed} = 7.616, F(1, 148) = 9.612; p = .002; \(n_p^2 = .061\); cohen’s f = 0.26). However, on the Second conjunction search task, the difference in response times between the ‘process-incomplete’ condition (for whom the process was now complete) and the ‘process-complete’ condition was insignificant (M\textsubscript{Incomplete LN_Transformed} = 7.881 vs. M\textsubscript{Complete LN_Transformed} = 7.853, F(1, 148) = 0.221; p = .639; \(n_p^2 = .001\); cohen’s f = 0.031). Please see figure 5 for the means of raw response latencies.

A sensitivity power analysis (Faul, Erdfelder, Lang, Buchner 2007) revealed that on the basis of the means, alpha significance criterion of .05 (two-tailed), and a standard power criterion (80%), a sample of one hundred and fifty would result in statistical power of cohen’s f = 0.19 for the main effects and cohen’s f = 0.11 for the interaction effects.

<Insert Figure 5 About Here>

Summary

Although the coupon was not received/ emailed immediately in the ‘process-incomplete’ condition, there was no normative reason for this to chain one’s attention. The outcome is as certain as possible – there is no reason to doubt that it will be emailed shortly – and there is no way to control or affect the process. Yet we find that these individuals were unable to suspend
attending to the process and consequently performed poorly with higher response times on the first conjunction search task. However, once the process was made complete after emailing the promised coupon (i.e. once the process had reached its end), these individuals were able to stop attending to the process, thereby freeing up the previously captured attentional resources. Consequently, their performance on the second conjunction search task was similar to those who were in the ‘process-complete’ condition.

It would be better if we could find more direct evidence that the incomplete process is in fact the target of individuals’ attention chaining. We turn to this in Study 4 where we used eye-tracking as a surreptitious method of observing what individuals are attending to.

**STUDY 4**

In this study, each individual had to send a message to a person randomly selected from a group of people sitting in the next room. Once individuals typed their message, they printed it using the print command. With the use of text information that appeared on the screen of their workstation, individuals were informed about the delivery of their message. In the case where the process was ‘complete’, individuals were informed that a research assistant had delivered their printed message to the selected person in the next room. Alternatively, in the case where the same process was ‘incomplete’, individuals were informed that their message was queued at the printer and that the research assistant would deliver the message to the selected person once it was printed.

Similar to the set up in our previous studies, we can note that these individuals could not impact the process and its outcome, in the sense that they could not affect when the selected person would receive their message. Clearly, this incomplete message delivery process does not warrant any more of individuals’ attention. Yet, in line with our previous predictions, we argue
that these individuals will be unable to stop attending to this process, presumably until their message does get delivered. Of importance, we utilized an eye tracker to surreptitiously investigate whether individuals are in fact attending to the incomplete message delivery process while performing other unrelated tasks.

**Methods**

Sixty-five undergraduate students enrolled at a major research university in the US participated in a single factor (process-incomplete Vs process-complete) between subjects eye tracking study. Participants were randomly assigned to either the ‘process-complete’ condition (N=31) or to the ‘process-incomplete’ condition (N=34).

All the participants were initially seated in a big lab (lab A) and were asked to do an unrelated task. Then we gave the participants a cover story. They were told that the study was about communications in which individuals would be sending and receiving messages to one another in the study. They were told that one by one they would be going to an adjacent lab (lab B) for completing the study. There they had to type a message that would be sent to a randomly selected participant sitting in the big lab A. Essentially, a randomly selected person in lab A would receive a message typed by the participant who had gone to lab B before her/him. The randomly selected person would first read the message in lab A and then s/he would enter lab B. In lab B, this person would type a message which would consist of what s/he remembers from the message that was read in lab A plus a couple of more similar sentences which s/he could generate and write on her/his own. Participants were told that they would be given further instructions upon entering lab B.
After the above cover story, the first participant in lab A was given a message and was asked to read it (s/he was told that it was written by the last person who had gone into lab B from the last experimental session). The message consisted of five trivia statements: ‘The capital of Argentina is Buenos Aires; the currency of India is the Rupee; the current king of Jordan is Abdullah 2; light is actually made up of 7 colors; the President of Russia is Vladimir Putin’. Then this participant was escorted to lab B. Upon entering lab B, the participant was told to type whatever s/he remembered from the message s/he had read plus a couple of statements of trivia on her/his own. These statements could be about any topic. Once the participant had finished typing the message, s/he gave the command to print the message (this printer was right outside lab B). The participant was told that the RA would collect the printout from the printer and would deliver the message to the next person. S/he was told that a workstation number from the big lab A had been selected randomly and the person sitting on that workstation would receive the message s/he had typed.

Next, the participant got ready for the eye tracking task. The eye tracker was present in lab B. On an instructions screen, the participant was told that s/he would be performing a word search task on the next screen where s/he would see a grid of letters. The participant had to count the number of times the word ‘CHAIR’ appeared in the grid. S/he was told that the word search task was timed and would auto-proceed to the next screen after a minute, where the participant would be required to enter the response. After this ‘instructions’ screen, the participant pressed ENTER to move on to the next screen, the layout of which is described below.

At the top of the screen, the participant first saw some text information regarding the delivery of the message s/he had typed and printed earlier. This text information essentially
served as the target area of interest. The current participant, if belonging to the ‘process-complete’ condition, saw the following text information: ‘By the way, the person sitting at computer 9 has received the print out of your message’.

Alternatively, if the current participant belonged to the ‘process-incomplete’ condition, s/he saw the following text information: ‘By the way, the message you sent is still waiting in queue to get printed. After it is printed, the RA will collect the printout and will deliver it to the person on computer 9’.

Thus the participant, depending on the experimental condition s/he was in, first read whatever text information appeared at the top of the screen. This text information that informed the participant about the delivery of his/her message appeared at the top of the screen for 15 seconds. A pre-test done with different participants from the same student population to check whether 15 seconds were sufficient for participants in both experimental conditions to read the text proved this to be the case.

After 15 seconds, a word search task automatically appeared at the bottom of the screen, just below the text information the participant had read. Participants were told that this information about the delivery of their message would remain fixed at the top of the screen and would not change. They were asked to complete the word-search task as accurately as they can.

Figure 6 panels (a) and (b) illustrate how the screen looked to participants in the ‘process-complete’ and ‘process-incomplete’ conditions respectively while they performed the word search task. Also, the text AoI (target Area of Interest) and the task AoI are shown in the figure with rectangular frames. These rectangular frames were not visible to the participants. The physical dimensions of the text AoI (as well as the task AoI) were the same for the two conditions.

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We tracked each participant’s eye fixations while s/he was doing the word search task. The fixation instances on the target Area of Interest (where the text information regarding the delivery of the message was displayed) as well as task part of the screen (where the word search task was displayed) were measured for each participant. Binocular eye movement data were recorded using a noninvasive Tobii X2-60 Eye Tracker that records the accuracy of eye movements to 0.4° of visual angle. The eye tracker measures visual scanning by computing the pupil-corneal reflection at a sampling rate of 60 Hz (i.e. 60 gaze data points are collected per second for each eye) based on the reflection of near-infrared light from the cornea and pupil.

After the word search task, the screen auto-proceeded to the next screen where the participant was asked to enter the number of times the word ‘chair’ appeared. Then, the participant was thanked and asked to leave the lab. After this, the next randomly selected participant sitting in lab A was given the message print out.

Irrespective of what the last person had typed and sent for printing, we gave the same initial message with the same five statements of trivia to the next participant as well. However as mentioned earlier, this next participant was made to believe that this message was written and sent by the participant who went into lab B before him/her. We did this to control for any kind of variance (e.g., mood effects) that could arise from reading different messages.

Results

We analyzed the fixation instances on the two parts of the screen: the ‘target text part’ where participants were shown the text information about the delivery of their message; and the
‘task part’ where participants performed the word search task. As can be seen figure 6, we had specified these two ‘areas of interest’ (AoI): the text AoI and the task AoI.

We analyzed the fixations on the ‘text’ AoI as a percentage of the total fixations a participant had on the screen (i.e., % fixations on the ‘text’ AoI = 100 x number of fixations on ‘text’ AoI / (number of fixations on both ‘text’ and ‘task’ AoI)). We ran a one-way between subjects ANOVA (‘process-incomplete’ condition Vs ‘process-incomplete’ condition) which revealed that, as predicted, participants in the ‘process-incomplete’ condition had significantly higher percentage of fixations on the text AoI when compared to participants in the ‘process-complete’ condition (M\text{percent fixations on text}_\text{Incomplete} = 9.44\% Vs M\text{percent fixations on text}_\text{Complete} = 5.38\%; F(1,63) = 4.528; p = 0.037; \eta^2_p = .067; cohen’s f = 0.27)^6. The heat maps in figure 7 illustrate the absolute number of fixations at various parts of the screen. A shade towards red stands for higher number of fixations than yellow which in turn stands for higher number of fixations than green. Panel (a) indicates fixation counts for a typical participant in the ‘process-complete’ condition and panel (b) indicates the same for a typical participant in the ‘process-incomplete’ condition.

In other words, participants in the ‘process-incomplete’ condition were likely to look up at the text information about the delivery of their message much more often, and consequently for more time, than those in the ‘process-complete’ condition.

A sensitivity power analysis (Faul, Erdfelder, Lang, Buchner 2007) revealed that on the

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^6 A similar analysis was done for fixation duration on the ‘text’ AOI as a percentage of the total fixation duration of a participant on the screen. Analysis revealed that participants in the ‘process-incomplete’ condition had higher percentage of fixation duration on the text AOI when compared to those in the ‘process-complete’ condition (M\text{percent fixation duration on text}_\text{Incomplete} = 8.81\% Vs M\text{percent fixation duration on text}_\text{Complete} = 5.24\%; F(1,63) = 3.372; p = 0.071).
basis of the means, alpha significance criterion of .05 (two-tailed), and a standard power criterion (80%), a sample of sixty-five would result in statistical power of cohen’s $f = 0.35$.

Summary

The eye tracking study lends more direct support to our position that individuals are in fact unable to suspend attending to the incomplete process. Clearly participants in the process-incomplete condition (whose message has not yet been delivered to the recipient) have their attentional resources chained to the message delivery process – they are unable to ignore the incomplete process and focus on the task they are supposed to be doing. We find in the eye tracking data that these participants look away from the word search task to fixate on the text information about the delivery of their message more often (greater fixation counts on the target ‘text’ Area of Interest for process-incomplete participants). Note again that there is nothing these individuals can do to influence the process, i.e., they cannot influence when the selected person would receive their message, and thus there is no normative reason to continue attending to this process. However, individuals are apparently helpless to do otherwise.

One can argue that participants in the process-incomplete condition have greater fixation counts on the ‘text’ AoI as they may expect the text information to change and reflect any update regarding the delivery of their message. In other words, it is the fact that the incomplete process is still unfolding in our field of awareness that compromises our attention. We would like to point out that this is no less non-normative. Our ability to ignore distractions and focus on a focal task is usually regarded as appropriate processing. It should also be pointed out that Studies 2 & 3 provide exactly this data – there is no reference to the incomplete process on the computer screen while participants performed the conjunction search task in Studies 2 & 3. Thus, even when the
incomplete process is out of sight, it is still apparently held in mind and attended to sufficiently to compromise performance on the conjunction search task.

In addition, the purpose of the eye-tracking study was to collect more direct evidence for our position that it is in fact the incomplete process which is the target of individuals’ attention chaining. This is the reason why it was imperative to have an Area of Interest (AoI) linked to the incomplete process; the text information about the delivery of participant’s message served as the target Area of Interest. Moreover, we had told the participants that this text information would remain fixed at the top of their screen and would not change while participants performed the word search task. It seems unlikely that participants were expecting the text information to change.

To summarize, studies 2, 3 & 4 help us validate a key part of our process account. We see from these studies that individuals are unable to stop attending to an incomplete process till it reaches its end, in spite of the process not warranting one’s attention. Please note that in study 2, we also showed that attention chaining mediates the negative influence of the incomplete process on attitudes towards associated entities. While delineating our process account, we argued that such a perverse chaining of attentional resources to the incomplete process should produce a subjective experience of unease or a negative hedonic marking – In our next study, we find evidence for the same. This negative affect gets misattributed and manifests in the form of decreased attitudes towards the associated entities.

Negative hedonic marking from the incomplete process & Attitude biasing

Since attention is a limited capacity resource, individuals are likely to experience a sense of unease at its being tied up – they would rather these attentional resources, which are currently
tied up in the incomplete process, be made available for other tasks like environment scanning --that is, attentional hijacking is hedonically marked. This negative hedonic marking is susceptible to misattribution towards the salient available target, as documented previously in many domains and phenomena (Alter & Oppenheimer 2009; Schwarz & Clore 2007). Essentially, this negative feeling of unease is used as information while individuals evaluate entities associated with the process, thus biasing their attitudes (Schwarz & Clore 1983, 1996). Thus, in study 4, we find evidence for the negative hedonic marking created from the perverse attention chaining to the incomplete process and its misattribution ---which manifests in the form of decreased attitudes towards entities associated with the process.

**STUDY 5**

If our position that incomplete processes that do not warrant, but nonetheless consume, attention give rise to a negative hedonic marking is correct, then we should observe decreased attitudes towards the associated entities only if the negative affect is (mis)attributed to those entities (Loewenstein, Weber, Hsee & Welch 2001). If the negative affect is instead misattributed to an external source completely irrelevant to the incomplete process (for instance, background music the participants may hear while doing the study), then the entities associated with the process will not be the target of the negative affect and will not be penalized with decreased attitudes (Novemsky, Dhar, Schwarz & Simonson 2007, Winkielman, Schwarz, Fazendeiro & Reber 2003). In line with past research, we use a similar misattribution paradigm in our current study and make participants hear a piece of music while they undertake the study (Reber, Schwarz & Winkielman 2004; Mishra, Mishra & Nayakankuppam 2007). We expect the observed effect of the incomplete process on attitudes towards associated entities to reduce when
participants are suggested that the negative affect they are experiencing is due to the music they are listening to.

Methods

One hundred and sixty-six undergraduate students enrolled at a major research university in the US participated in a 2(process-incomplete Vs process-complete) X 3(Misattribution: unpleasant music Vs pleasant music Vs control (no misattribution to music)) between-subjects study. Participants were invited to be seated at their work stations and were asked to put on the ear-phones. All participants were told that they would be hearing some music while doing the study. Specifically, all participants were given the cover story “Please read the following instructions carefully. Lots of people listen to music while they work on their computers. We want to simulate such a situation in the lab. For experimental control we have selected the music and will play it for you. We want you to listen to this music while you perform the given task. Please note: You would not have heard this music before; so this music will be novel.” At the end of cover story, about one-third of the participants were told that “Please note that some people experience novel music as being mildly unpleasant” (unpleasant music misattribution condition). Another one-third of the participants were told that “Please note that some people experience novel music as being mildly pleasant” (pleasant music misattribution condition). The remaining one-third of the participants were not given this additional statement in the cover story (control misattribution condition). While doing the subsequent task, participants listened to music which was an ambiguous New Age piece played at half speed in the reverse direction.

Following the ‘misattribution manipulation’, all participants irrespective of the experimental condition were asked to imagine being in the same money transfer scenario used in studies 1a and 2, where they had to send money to a friend in Utah. Then, about half the
participants in each of the misattribution conditions were assigned to the ‘process-complete’ condition and the remaining were assigned to the ‘process-incomplete’ condition. These conditions were identical to the ones used in study 1a and 2.

The background music stopped paying at this point. Participants then reported their attitudes towards the money transfer company on a four-item (bad-good; unfavorable-favorable; unpleasant-pleasant; negative-positive) 9-point (from -4 to 4) Likert type scale.

As per our account, the incomplete-process condition gives rise to a negative affect which participants misattribute to entities associated with the process, in the absence of any other external source like background music. Hence, in the control condition (no misattribution to music), we expect our core results to hold in that, participants’ attitudes towards the money transfer company will be lower in the process-incomplete condition than in the process-complete condition. In the pleasant music condition, participants are expecting to feel pleasant but would actually experience the unease from attentional chaining – this should result in a search for attributing this negative affect, and the entity associated with the incomplete process is a salient, available entity. Hence when the music is pleasant, we expect that participants in the process-incomplete condition will attribute the negative affect from the incomplete process to the entities associated with the process (in this case, the money transfer company when they are asked about it). These participants should thus have decreased attitudes towards the money transfer company when compared to those in the process-complete condition.

When participants are told that the music might be mildly unpleasant, we expect that participants in the ‘process incomplete’ condition will attribute the negative affect from the incomplete process to the music and hence, will not report lower attitudes towards the money transfer company. Hence, in the unpleasant music condition, we expect that there will be no
differences in attitudes towards the money-transfer company between the process-incomplete condition and the process-complete condition

Analysis and Results

Participants’ attitudes towards the money transfer company was used as the DV for the two factor between subject design. Analysis revealed a significant main effect of process ‘incomplete vs complete’ factor ($M_{\text{Incomplete}} = 0.960$ Vs $M_{\text{Complete}} = 1.997$; $F(1,160) = 10.592; p = 0.001; n^2_p = .062$; cohen’s $f = 0.28$), and, insignificant main effect of misattribution manipulation ($M_{\text{pleasant music}} = 1.580$ Vs $M_{\text{unpleasant music}} = 1.803$ Vs $M_{\text{control}} = 1.108$; $F(2, 160) = 1.341; p = 0.264; n^2_p = .016$; cohen’s $f = 0.13$).

Central to the test of our explanation, the interaction was significant ($F(2, 160) = 3.629; p = 0.029; n^2_p = .043$; cohen’s $f = 0.21$). Follow-up analysis revealed support for our position. We replicated our core results (attitudes were significantly lower in the process incomplete condition than the process complete condition) in the control condition where there is no misattribution to music ($M_{\text{Incomplete}} = 1.019$ Vs $M_{\text{Complete}} = 2.587$; $F(1,50) = 8.268; p = 0.006; n^2_p = .142$; cohen’s $f = 0.41$) as well as in the pleasant music condition ($M_{\text{Incomplete}} = 0.375$ Vs $M_{\text{Complete}} = 2.010$; $F(1,56) = 11.528; p = 0.001; n^2_p = .071$; cohen’s $f = 0.28$). Alternatively, in the unpleasant music condition, attitude was insignificantly different between the process-incomplete and process-complete condition ($M_{\text{Incomplete}} = 1.677$ Vs $M_{\text{Complete}} = 1.503$; $F(1,54) = 0.084; p = 0.773; n^2_p = .002$; cohen’s $f = 0.05$). Please see Figure 8 for the results of Study 5.

A sensitivity power analysis (Faul, Erdfelder, Lang, Buchner 2007) revealed that on the basis of the means, alpha significance criterion of .05 (two-tailed), and a standard power criterion
(80%), a sample of one hundred and sixty-six would result in statistical power of Cohen’s $f = 0.24$ for the effects.

<Insert Figure 8 About Here>

Summary

The pattern of results provides evidence for the presence of the negative hedonic feeling arising from the incomplete process. The results lend support to our position that individuals, by default, misattribute this negative feeling they are experiencing to the entities associated with the process.

STUDY 6

An integral part of our process account is that the incomplete process is an integral part of our process account. One of the key alternate arguments here is that attention chaining to the incomplete process occurs due to individuals being uncertain about the outcome of the process and not due to the process being ‘incomplete’. We had tried to negate this alternate explanation by pretesting that individuals in the process-incomplete condition are equally certain about the outcome of the process just as those individuals in the process-complete condition in demonstration studies 1a, 1b and 1c. In addition to that we had also measured individuals’ need for closure as well as goal pursuit in these demonstration studies and found that neither need for closure (i.e., aversion towards uncertainty) nor goal pursuit moderated the core phenomenon.

While the above evidence provides qualified support, we administer study 6 to provide unequivocal support for the position that attention chaining does in fact take place by virtue of the process being incomplete, even when the outcome of that process is fully certain and known.

The idea behind study 6 was to create conditions so that we can have process
incomplete/complete and outcome uncertain/certain as separate factors. In study 6, we created four different conditions namely, 1) process is complete and the outcome is certain, 2) process is incomplete and the outcome is certain, 3) process is complete and the outcome is uncertain, and, 4) process is incomplete and the outcome is uncertain.

We predict that even when the outcome is fully certain, we will observe significant differences in attention chaining between the process complete and incomplete conditions. This prediction is line with our position that an incomplete process, just by virtue of just being ‘incomplete’, chains attentional resources even when the outcome is certain. However, when the outcome is uncertain, we posit that we will not see significant differences in attention chaining between the process complete and incomplete conditions. This is because outcome uncertainty will override the impact of any other factor such as process completion/incompletion and will result in significant attention chaining. In other words, individuals’ attention will be chained in the process, irrespective of whether the process is complete or incomplete, due to the uncertain outcome. Hence, we predict high levels of attention chaining in both the process complete and incomplete conditions when the outcome is uncertain.

Methods

Two hundred and thirty-four undergraduate students enrolled at a major research university in the US participated in a 2(process-complete Vs process-incomplete) X 2(outcome certain Vs outcome uncertain) between-subjects study. Participants, upon entering the lab, were told that they would see multiple tasks.

On the first screen, participants were shown a message about a color changing magic square – “On the next screen you will see a magic square which keeps changing its color from red to blue to red and so on. This process is known as ' Skipping '. The screen will be shown for a
few seconds during which the color of the magic square will change multiple times i.e., the magic square is 'skipping'. Based on the color of the magic square at the end of the 'skipping' process, you will receive a payoff in dollars”.

Essentially, the magic square ‘skipping’ process and the associated payoffs were used to manipulate process complete/incompleteness as well as outcome certain/uncertainty. Essentially, the factors were manipulated by showing the following screens to the individuals based on the condition they were randomly assigned to.

<Insert Table 1 About Here>

The dependent variable in the study was individuals’ response latencies across the trials of the conjunction search task (mentioned as ‘Screen 5’ in the above table). The conjunction search task was identical to the one used in study 2 in which participants had to locate, as fast and as accurately as possible, the red circle on the screen. Performance on the conjunction search task served as a measure of the attention being chained to the ‘Skipping’ process participants saw earlier. Please refer to Study 2 for details about the Conjunction search task.

As can be seen in the table, in the ‘process complete – outcome certain’ condition: The skipping process was ‘complete’ for these participants - they knew the color the magic square ended up with - before they started the conjunctions search task. Additionally, participants’ payoff was $5 irrespective of whether the magic square ‘skipping’ ends up in red color or blue color – hence the outcome of the skipping process was ‘certain’ as well.

In the ‘process incomplete – outcome certain’ condition: The skipping process had not ended and was still going on when the participants did the conjunction search task – hence, the process was ‘incomplete’. However, participants were aware of the fact that they would receive
$5 irrespective of the skipping process ending in red or blue color – hence, the outcome was ‘certain’ during the conjunction search task.

If our position that an incomplete process, by virtue of being incomplete, chains individuals’ attention then we should see significant differences in attention chaining between the process complete and incomplete conditions, when the outcome of the skipping process (i.e., the payoff) is certain. For the sake of completing the factorial, we also included the other two conditions.

In the ‘process complete – outcome uncertain’ condition: The skipping process was ‘complete’ for these participants – they knew the color the magic square ended up with - before they did the conjunction search task. However, participants did not know their payoff associated with the color (as the payoffs were different for the skipping process ending in blue or red color) while they undertook the conjunction search task -- hence the outcome was ‘uncertain’ for them.

In the ‘process incomplete – outcome uncertain’ condition: The skipping process had not ended and was still going on when the participants did the conjunction search task, thus, making the process ‘incomplete’. But, in this condition, participants did not know their payoff (as the payoffs were different for the skipping process resulting in red or blue color) while they were doing the conjunction search task – hence, the outcome was ‘uncertain’ for them.

The outcome is uncertain in the above conditions. We posit that we will not see significant differences in attention chaining between the process complete and incomplete conditions, when the outcome of the skipping process (i.e., the payoff) is uncertain. This is because individuals’ attention will be chained in the skipping process, irrespective of whether the process is complete or incomplete, due to the uncertain outcome/payoff. Essentially, if the
outcome of a process is uncertain, it is logical to attend to the process to see what outcome it generates. Therefore, no hedonic signal should be generated in such cases and that is why we predict no differences. If our position is correct, we should see high levels of attention chaining in both - ‘process complete – outcome uncertain’ and ‘process incomplete – outcome uncertain’ - conditions.

**Analysis and Results**

Participants’ response times (i.e. the time taken to locate the red circle) for the trials of the conjunction search task were used for analysis. There were 2340 responses (each of the 234 participants had ten responses for the conjunction search task). Only correct responses were included in the analysis. Response times were log transformed. A mixed-proc model was run in SAS where the correct responses by a participant were nested within each participant. Analysis revealed that the main effect of process complete versus incomplete as well as outcome certain vs uncertain was insignificant. More importantly, the 2(process-complete Vs process-incomplete) X 2(outcome certain Vs outcome uncertain) interaction was significant \( F(1, 230) = 5.670; p = .018; \ n_p^2 = .028; \ cohen’s f = 0.17 \)

Further analysis revealed that **when the outcome was certain**, participants in the ‘process-incomplete condition’ had significantly higher response times for successfully locating the red circle among the distractors, when compared to those participants who were in the ‘process-complete condition’ \( M_{Incomplete\_LN\_Transformed} = 7.54 \) vs. \( M_{Complete\_LN\_Transformed} = 7.42 \), \( F(1, 123) = 6.640; p = .011; \ n_p^2 = .034; \ cohen’s f = 0.19 \). This is a key result as it indicates that when the skipping process was incomplete, it did in fact chain up individuals’ attentional resources, even when the outcome of the skipping process was certain. As a result, these individuals performed poorly on the conjunction search task that followed when compared to
those for whom the skipping process was complete. Additionally, **when the outcome was uncertain**, there were no significant differences between the process-incomplete and process-complete conditions ($M_{Incomplete\_LN\_Transformed} = 7.52$ vs. $M_{Complete\_LN\_Transformed} = 7.55$, $F(1, 107) = 0.660; p = .418; \eta^2_p = .002; \text{cohen’s } f = 0.05$). Please see figure 9 for absolute means.

A sensitivity power analysis (Faul, Erdfelder, Lang, Buchner 2007) revealed that on the basis of the means, alpha significance criterion of .05 (two-tailed), and a standard power criterion (80%), a sample of two hundred and thirty-four would result in statistical power of cohen’s $f = 0.18$ for the effects.

<Insert Figure 9 About Here>

**GENERAL DISCUSSION**

We set up conditions across all our experiments where individuals attend to a process, the completion of which they cannot control or affect, and whose outcome is known with certainty. Given such conditions, the process clearly does not warrant individuals’ attention. However, from studies 2, 3, 4 and 6, we see that individuals are in fact unable to switch ‘off’—this attention chaining in fact mediates the negative influence of the incomplete process on attitudes towards the associated entities. Such a ‘perverse’ chaining of our attentional resources to the incomplete process should produce a subjective experience of unease. Since attention is a limited capacity resource, individuals would rather these attentional resources, which are unnecessarily currently tied up in the incomplete process, be made available for other tasks like environment scanning. In study 5, we find evidence for our position that attending to the incomplete process produces a negative hedonic marking which gets misattributed and manifests in the form of decreased attitudes towards associated entities. We demonstrated this attitude biasing consequence in a variety of domains in studies 1a, 1b & 1c.
Theoretical Contributions

Prior research has examined human attentional mechanisms in terms of how we direct attention and select what to attend to (Pashler et al. 2001) but theories are relatively silent about how we cease paying attention to a stimulus. In this regard, the extant theories do recognize that attention to a particular stimulus may reduce or disappear altogether due to a reallocation of processing capacity – in other words, one ceases attending to a stimulus when some other stimulus overwhelms the first in its demand for attentional resources. However, in the absence of a such a competing stimulus that wrenches our attention away, our work suggests that we as human beings may not have evolved an internal off-switch for attention. Meaning that - once we start attending to a process, just by virtue of it being ‘incomplete’, we continue attending to it until its completion even when that attention is unwarranted (as demonstrated in studies 2, 3, 4 and more importantly 6). So, our work, suggesting the absence of an internal 'off' switch to attention, opens an untapped avenue in the attention literature.

It is worth noting that in our studies where we have used the conjunction search task to measure attention being chained to the incomplete process, one can argue that a distraction, such as the conjunction search task, in the environment can act as an ‘off’ switch and can reduce, even nullify, the attention being paid to the primary task. While our work suggests that distraction can indeed act as an ‘off’ switch for attention under certain conditions, this question can be further explored in future research.

Another aspect worth discussing is that our studies establish who and what we pay attention to largely depends on the events and stimuli in our environment. Hence, attention can be deemed as externally driven to a certain extent, and, thus context sensitive. In this vein, we show that the ‘incompleteness’ of a process in the external environment leads to significant
attention chaining. There can be many more contexts beyond process incompletion which can indeed impact the allocation of our attentional resources. It is worth investigating this proposition and to look for various context effects that moderate allocation of attention.

Our work also provides evidence for the downstream implications of such an attention chaining to incomplete process – we provide evidence for the presence of the negative affect and consequent decreased attitudes towards the entities associated with the incomplete process (studies 1a, 1b, 1c, 2 and 5). Hence, our work makes a substantial contribution to the attention literature in terms of both theory and implications.

**Marketing Implications**

Our results have significant marketing implications. Many seemingly appropriate marketing offerings or services can have perverse rebound effects. Take, for instance, the gift card industry, which in US alone is worth about USD 100 billion a year. As we have shown, giving a gift card leads to a capture of attention in the gifting process, which in turn, results in less favorable attitudes towards the store. Thus, our work introduces an important implication of gift cards that retailers need to factor in while offering more gift cards to consumers. Note also the inter-temporal inconsistency – individuals freely express a preference for the gift card (which is a perfectly reasonable response). However, at some later point in time, they penalize the store that offered them the gift card.

Similarly, it would seem an appropriate service to offer tracking data to consumers who have made purchases – however, while the consumer may appreciate the service initially, the chaining of attention to tracking the progress of the shipment and the associated negative hedonic marking might result in an eventual penalizing of the retailer. A better option might be to send the consumer daily status updates, rather than a tracking number.
The results also signal that it may not be beneficial for a company to place its online banner advertisements on web platforms of companies where the transactions are (usually) not completed instantaneously (e.g. money remittance companies). First, it is possible that the advertisement may not receive adequate attention as individuals’ attentional resources will be grabbed by the incomplete transaction. Second, even if the advertisement gets individuals’ attention, it may become a target of misattribution of the negative feeling of unease, which arises due to the incomplete transaction.

We would like to add that although most of the studies carried out with students as participants, we believe that the results should hold true for general population as well. We have no reasons to believe that the education and other broad demographics will impact the influence of attentional bias. However, it will be interesting to see if the effect sizes of the demonstrated phenomenon increase with older people as participants since attention spans tend to get lower (e.g., Zanto & Gazzaley 2014)

Future Directions

Our studies have dealt with relatively unimportant forms of incomplete processes. This was intentional in order to show the lingering impact of even these kinds of relatively trivial processes. The impact of more consequential processes are potentially much larger. Consider, for example, caring for a loved one in times of sickness or worse, or considering some aspect of parenting (e.g., teaching a child patience), or paying off debt. At some point, one has done what is possible and nothing more can be done and arguably more fussing might make things worse. Yet, introspection suggests we are unable to ignore this and are often plagued by counterfactuals and thoughts along the lines of, “What else can I do?” Our work also suggests an associated resentment of the person responsible for this chained attention and might provide one
explanation for why caregiving is so emotionally tiring. Understanding this might also help us devise ways to cope with this form of fatigue.

Another potentially fruitful avenue of exploration might be to explore strategies people use to actually stop attending. We surmise that individuals are most likely to utilize distraction. In the absence of an ability to ‘switch off,’ individuals are likely to fall back on attempting to find competing stimuli in the environment to wrench attention away from the process that has hijacked it. Consider examples such as taking a child out for ice cream to stop him/her ruminating on something, or more destructive examples such as shopping or eating to distract from other worries that may be plaguing one’s life.
REFERENCES


Table 1. Manipulations Used in Study 6

<table>
<thead>
<tr>
<th>Outcome Certain (Payoff is same for both colors)</th>
<th>Skipping Process - Complete</th>
<th>Skipping Process – Incomplete</th>
</tr>
</thead>
<tbody>
<tr>
<td>Screen 2: Payoff Information: “If the 'skipping' process ends with blue color: $5, If the 'skipping' process ends with red color: $5”</td>
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</tr>
<tr>
<td>Screen 3: The skipping process starts. The magic square is shown changing its colors</td>
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</tr>
<tr>
<td>Screen 4: “The 'skipping' process has ended with the color 'blue'. Your payoff is: $5”</td>
<td>Screen 4: “The skipping process is still going on. You will know the result of the 'skipping' process (i.e., what color the magic square ends up with) at the end of the next task”</td>
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<tr>
<td>Screen 5: The Trials of Conjunction Search Task (measure of attention chaining)</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Outcome Uncertain (Payoff is different for each color)</th>
<th>Skipping Process - Complete</th>
<th>Skipping Process – Incomplete</th>
</tr>
</thead>
<tbody>
<tr>
<td>Screen 2: Payoff Information: “If the 'skipping' process ends with blue color, you will receive a certain amount in dollars and if it ends with red color, you will receive a different amount. The exact payoff that you will receive when the 'skipping' process ends will be revealed to you later on in the study.”</td>
<td>Screen 2: Payoff Information: “If the 'skipping' process ends with blue color: $5, If the 'skipping' process ends with red color: $0”</td>
<td>Screen 2: Payoff Information: “If the 'skipping' process ends with blue color: $5, If the 'skipping' process ends with red color: $0”</td>
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<td>Screen 4: “The 'skipping' process has ended with the color 'blue'. The exact payoff that one receives when the 'skipping' process ends with blue will be revealed to you after you complete the next task.”</td>
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</tbody>
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FIGURES

Figure 1. Options Given to Participants in Study 1 to Choose a Birthday Gift From
Figure 2. Screen Showing a Trial of the Conjunction Search Task Used in Study 2
Figure 3. Regression Coefficients for the Mediation Analysis for Study 2

**Attention Chaining**

- .121*

**Process incompletion/completion**

- .702* (-.448)

**Attitude**

- 2.086*
Figure 4. Screen Showing a Trial of the 2nd Conjunction Search Task Used in Study 3
Figure 5. Results of Study 3

![Bar chart showing mean response time per trial (milliseconds) for Task 1 and Task 2 in Process-Incomplete and Process-Complete conditions.]

- Task 1:
  - Process-Incomplete Condition: 2431 milliseconds
  - Process-Complete Condition: 2095 milliseconds

- Task 2:
  - Process-Incomplete Condition: 2837 milliseconds
  - Process-Complete Condition: 2733 milliseconds
Figure 6. Word Search Task Screen in the Eye Tracking Study

(a)

(b)
Figure 7. Heat Maps Depicting Fixation Count

(a)

By the way, the person sitting at computer 9 has received the printout of your message. Thanks!

(b)

By the way, the message you sent is waiting to get printed. After it is printed, the RA will collect the printout and deliver it to the person on computer 9.
Figure 8. Results of Study 5

![Bar chart showing attitudes (−4 to +4) for three conditions: Music Unpleasant, Control, and Music Pleasant. The chart indicates the number of participants in each condition with incomplete and complete data.](chart.png)
Figure 9. Results of study 6

![Bar chart showing mean response time per trial (milliseconds) for certain and uncertain outcomes. The chart compares Process-Incomplete Condition and Process-Complete Condition.]
APPENDIX

Items for Need For Closure (NFC) scale used in studies 1a, 1b, and, 1c
(Roets & Van Hiel 2011)

Read each of the following statements and decide how much you agree with each according to your beliefs and experiences (6 point scale from strongly disagree to strongly agree).

1. I don't like situations that are uncertain.
2. I dislike questions which could be answered in many different ways.
3. I find that a well ordered life with regular hours suits my temperament.
4. I feel uncomfortable when I don't understand the reason why an event occurred in my life.
5. I feel irritated when one person disagrees with what everyone else in a group believes.
6. I don't like to go into a situation without knowing what I can expect from it.
7. When I have made a decision, I feel relieved.
8. When I am confronted with a problem, I’m dying to reach a solution very quickly.
9. I would quickly become impatient and irritated if I would not find a solution to a problem immediately.
10. I don't like to be with people who are capable of unexpected actions.
11. I dislike it when a person's statement could mean many different things.
12. I find that establishing a consistent routine enables me to enjoy life more.
13. I enjoy having a clear and structured mode of life.
14. I do not usually consult many different opinions before forming my own view.
15. I dislike unpredictable situations.

Items for (Tenacious Goal Pursuit) TGP scale used in study 1c
(Brandstädter & Renner 1990)

Read each of the following statements and decide how much you agree with each according to your beliefs and experiences (5 point scale from strongly disagree to strongly agree).

1. Even when things seem hopeless, I keep on fighting to reach my goals
2. I stick to my goals and projects even in the face of great difficulties
3. The harder a goal is to achieve, the more appeal it has to me
4. I can be very stubborn/obstinate in pursuing my goals
5. To avoid disappointments, I do not set my goals too high