Auction Fever: The Unrecognized Effects of Incidental Arousal

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Highlights

- Auction fever research has only considered the effects of integral arousal.
- We show that incidental arousal also increases bidding.
- Bidders are unaware of the effects of incidental arousal on bidding.
- Our research explains what causes auction fever and why it persists.

Abstract

Despite countless anecdotes about emotionally-charged bidding in auctions, there is little research to help understand what causes auction fever and why it persists. Because research has only considered how integral arousal (i.e., arousal from within the auction) affects bidding, the current research considered whether incidental arousal (i.e., arousal from outside the auction) also increases bidding. With two different manipulations of arousal, Experiments 1 and 2 showed that incidental arousal increased bidding in live auctions with monetary stakes. Experiment 1 also measured arousal physiologically to demonstrate its role in bidding. Experiment 3 utilized a third manipulation of incidental arousal and found that individuals were unaware of its effects. Overall, the current research demonstrates how bidders are potentially subject to many different sources of arousal that have nothing to do with auctions, all of which can unwittingly increase individuals' bidding.

Keywords: Arousal; Auctions; Economic Exchange; Heart Rate

> *Perhaps nowhere on the planet is the combination of art, power and glamour quite so heady. Attend one of Sotheby's standing-room-only auctions of Impressionist and modern art, and you will feel, if only by association, the adrenalin rush triggered by high-stakes bidding.* (Prince, 1999, p. 171-172)

The opening quote suggests anecdotally that auction bidding can involve significant levels of arousal (i.e., sympathetic activation of the autonomic nervous system, Schachter & Singer, 1962). These observations have led to the concept of "auction fever" or "the emotionally charged and frantic behavior of auction participants that can result in overbidding" (Ku, Malhotra, & Murnighan, 2005, p. 90). Research has empirically demonstrated the existence of auction fever (Jones, 2011; Ku et al., 2005). For instance, Jones (2011) observed that final prices for 41.1% of eBay auctions for Amazon.com gift certificates exceeded the certificates' face value. Research has also examined when auction fever occurs, focusing on how elements inherent to auctions stimulate arousal, which then increases bidding (Adam, Krämer, & Müller, 2015; Ku et al., 2005; Malhotra, 2010).

Auctions have become increasingly important, both theoretically and practically. Economists (for reviews, see Kagel, 1995; McAfee & McMillan, 1987) have studied how and when auctions can efficiently establish market prices. However, economists have generally shied away from examining the emotional factors involved in auction fever. Instead, economists typically adopt an assumption of rationality, i.e., that bidders make economically rational decisions (McAfee & McMillan, 1987; Vickrey, 1961). As a result, the very existence of auction fever is disputed (e.g., Boehnke, 2013; Lee & Malmendier, 2011) and recent research on auction fever fails to mention arousal (e.g., Ehrhart, Ott, & Abele, 2015). In contrast, despite their expertise in examining the effects of emotions, psychologists have typically had little interest in understanding auctions (for exceptions, see Ball, Bazerman, & Carroll, 1991; Bazerman & Samuelson, 1983; Foreman & Murnighan, 1996; Ku, Galinsky, & Murnighan, 2006; Ku et al.,

2005; Malhotra, 2010; Murnighan, 2002). The result is that there is a lack of theory around what causes auction fever and why it persists.

This is concerning because auctions are ubiquitous. Competitive tendering processes in governmental and industrial contracts are fundamentally auctions. Similarly, the auction of government bonds, the emergence of eBay, housing auctions, and increased corporate acquisitions have all made auctions more than just a forum for the sale of art and antiques. Thus, auction fever can have significant financial repercussions. Importantly, we do not suggest that the effects of arousal on bidding are "good" or "bad". For instance, arousal-induced bidding may be "good" from the seller's perspective or "bad" from the buyer's perspective. Instead, the current research focuses on understanding what causes auction fever and why it persists.

Specifically, although extant literature has focused on how elements inherent to auctions fuel *integral arousal* and bidding, we examine whether *incidental arousal*, i.e., arousal generated outside the auction context, also increases bidding. If so, bidders could be affected by many different sources of arousal, including ambient music (Bernardi, Porta, & Sleight, 2005; Gorn, Pham, & Sin, 2001), wall colors (Valdez & Mehrabian, 1994), posters or paintings (Kurdi, Lozano, & Banaji, 2017), as well as whether they have recently been to the gym (Kim & Baron, 1988) or had an espresso (Barry et al., 2005). We further suggest that, consistent with work that individuals are not necessarily aware of relevant information that can affect their decision-making (e.g., Chugh & Bazerman, 2007; Gilbert & Wilson, 2000; Neisser, 1979), individuals are unaware of the effects of incidental arousal on bidding, making guarding against arousal more difficult and making increased bidding more likely.

Arousal and Auction Fever

Research has explored the effects of arousal across a range of decision-making tasks and domains (for reviews, see Peters, Västfjäll, Gärling, & Slovic, 2006; Rick & Loewenstein, 2008).

On one hand, arousal is an essential guide for human decision-making (Bechara & Damasio, 2005; Bechara, Damasio, Tranel, & Damasio, 1997) and arousal can improve task performance under certain circumstances (Brown & Curhan, 2013; Zajonc, 1965). For instance, experiencing arousal in response to monetary losses is critical for making advantageous financial decisions (Bechara & Damasio, 2005). On the other hand, arousal can narrow attentional capacity, limit information processing, and reduce cognitive flexibility (Easterbrook, 1959; Lewinsohn & Mano, 1993; Mano, 1992; Staw, Sandelands, & Dutton, 1981). For instance, compared to low arousal, high arousal is linked to increased risk taking (Mano, 1991) and greater loss aversion (Sokol-Hessner et al., 2008).

There has been some research on the role of arousal in auctions and auction fever. Ku, et al. (2005) proposed a competitive arousal model that highlighted how features inherent to auctions (e.g., rivalry, time pressure, presence of an audience) can stimulate arousal and increase bidding. For instance, the authors reported research that time pressure increases arousal (Maule, Hockey, & Bdzola, 2000) and reduces cognitive deliberation (Ordóñez & Benson, 1997). Similarly, Malhotra (2010) manipulated two antecedents of arousal – rivalry and time pressure – and found that they fueled a desire to win (even when winning was costly and provided no advantage), which then increased bidding. Finally, using physiological measurements, Adam, et al. (2015) showed that competition and time pressure increased arousal and bids. According to the competitive arousal model, auction fever occurs because increased arousal can "impair calm, careful decision-making" (Ku et al., 2005, p. 92).

Although this research is consistent with the anecdotal evidence on auction fever, it has only examined the role of integral arousal, i.e., arousal generated from the auction context. Thus, we do not know if incidental arousal, i.e., arousal generated outside the auction context, also affects bidding. Abundant research has robustly demonstrated that integral and incidental arousal

have consistent effects (e.g., Pham, 2007; Rick & Loewenstein, 2008). For instance, integral and incidental arousal similarly affected negotiators – arousal benefited negotiators when they had a positive attitude towards negotiations but harmed negotiators when they had a negative attitude (Brown & Curhan, 2013). As such, we hypothesize that incidental arousal will increase bidding.[1]

If incidental arousal increases bidding, this may help to explain why auction fever is not uncommon: not only are bidders subject to arousal from elements integral to auctions, they may also experience arousal from a myriad of other, non-auction elements, including music (Bernardi et al., 2005; Gorn et al., 2001), color (Valdez & Mehrabian, 1994), images (Kurdi et al., 2017), exercise (Kim & Baron, 1988), caffeine (Barry et al., 2005), crossing shaky bridges (Dutton & Aron, 1974), and hearing violent stories (White, Fishbein, & Rutstein, 1981).

Using two different manipulations of incidental arousal, Experiments 1 and 2 investigated whether incidental arousal increases bidding in real auctions with monetary stakes. To further clarify the role of arousal, Experiment 1 measured arousal physiologically.

Awareness of Incidental Arousal's Effects

We further argue that individuals are unaware of incidental arousal's effects on bidding, making guarding against arousal's effects ever more difficult.

Much research has examined how individuals are unaware of factors that affect their decisions (for a review, see Bazerman & Sezer, 2016). For instance, Neisser (1979) first demonstrated individuals' inattentional blindness: when participants focused on counting basketball passes, they ignored information that was otherwise blatantly obvious – a woman with an open umbrella walking among the basketball players. Similarly, Chugh and Bazerman (2007) referred to individuals' bounded awareness in describing how individuals ignore easily observable and relevant information. Finally, focalism refers to the tendency to focus too much attention on a particular event, while ignoring other concurrent events (Gilbert & Wilson, 2000).

Applying this body of research to auctions, bidders may be unaware of the effects of incidental arousal on bidding. If so, this would further clarify the causes and persistence of auction fever.

With a third manipulation of incidental arousal, Experiment 3 examined whether incidental arousal affects bidding even though individuals are unaware of this.

Experiment 1: Competitive, Incidental Arousal

Experiment 1 examined whether incidental arousal increases bidding and final prices in two live auctions that had financial consequences. Importantly, we measured arousal physiologically to provide evidence that our manipulation induced arousal and that arousal affects bidding. We also manipulated the monetary stakes (low and high) to test whether stakes moderated these effects.

Method

Participants and design. We used the Online Recruitment System for Economic Experiments (ORSEE) system (Greiner, 2015) to recruit 144 undergraduates (112 men, 32 women) at a German university.[2] Participants were compensated €10 plus their earnings from the arousal and auction tasks. Measurements failed (e.g., electrodes detached) or noise in the signal prevented accurate identification of the intervals between subsequent heart beats for 26 participants, who were equally distributed across the low- and high-arousal conditions. These common measurement problems reduced the final sample to 118 participants (92 men; 26 women). The experiment had a 2 (arousal: low, high) x 2 (stakes: low, high) mixed design with repeated measures on the second factor.

Procedure. Participants sat at individual cubicles with computer monitors. The auction procedures were implemented using z-Tree software (Fischbacher, 2007) and the incidental arousal induction task was implemented in Java. After attaching the electrodes, participants received instructions about the auction task and participated in two trial rounds with hypothetical

payoffs to ensure that they understood the rules and procedures. They then proceeded to the arousal induction task and, finally, to the two real auctions.

Arousal induction. To manipulate arousal, participants engaged in a 10-minute symbol-matching task: a five-symbol sequence appeared on the screen and participants had to choose the correct sequence from a list.

The *high-arousal condition* involved time pressure (Ku et al., 2005), competition (Ku et al., 2005), and energizing music (Bernardi et al., 2005) that was played throughout the task. Participants chose from 20-symbol sequences and had 7 seconds to make each decision. They received 20 points for every correct choice, lost 10 points for every incorrect choice, and lost 30 points if they took more than 7 seconds to make a choice. Participants' final payoffs depended on their relative performance, which was not revealed until the end of the experiment. Thus, after the auctions, the participant with the most points received €15; the second best participant received €12; the third best received €9, etc. Although participants competed against one another, the instructions pushed them to focus on the symbol-matching task. Additionally, participants did not interact with each other and received no information that would allow for social comparisons.

In the *low-arousal condition*, participants listened to soothing "spa" music. They chose from only 5-symbol sequences and had twice as much time (14 seconds) to make each decision. Their task performance did not affect their payoffs. Instead, to match their expected payoffs with those in the high-arousal condition, participants were told that they would roll a die at the end of the experiment for an additional payoff (from €0 to €15).

Auctions. Participants next engaged in two auctions, each with two other bidders. Because we were interested in the impact of incidental arousal, we minimized any arousal that a bidding-rebidding process might stimulate. Thus, participants bid on jars of money (i.e., items

that have an objective value, which is unknown to bidders at the time of bidding) in two auctions, in which each bidder made a single secret bid and the highest bidder won the item for the amount bid (also known as first-price sealed-bid auctions, Vickrey, 1961).

Stakes manipulation. The jars included low and high monetary totals, presented in random order. *Low-stakes* jars contained 1- and 2-cent coins, totaling €2.37; *high-stakes* jars contained 5- and 10-cent coins, totaling €11.85. Before placing their bid, participants could examine the jar. The values of the jars and auction results were revealed after the second round. If a participant won, they received a payoff of the true value of the jar minus the amount bid.

Physiological measurement of arousal. Participants wore chest straps (*Movisens Chest Belt EcgMove*) with dry-electrodes to provide an electrocardiogram (ECG; *Bioplux Researcher*) for information on the electrical activity of the heart. A beat detection program (Open ANSLAB) was used in offline analysis to detect R peaks in the raw digitized ECG. From this, an interbeat interval series was created and hand-corrected for artifacts. Focusing on participants' cardiovascular activity during the last minute of the symbol-matching task, we used Allen, Chambers, and Towers' (2007) CMetX tool to calculate a cardiac sympathetic index (CSI, Toichi, Sugiura, Murai, & Sengoku, 1997), which reflected sympathetic activation of the autonomic nervous system in response to the arousal induction task.

Bids and final prices. We recorded participants' two bids and calculated the final price for each auction. We standardized bids and final prices within the stakes conditions.[3]

Results and Discussion

Manipulation check. As predicted, participants in the high-arousal condition exhibited more arousal as measured by CSI (M=3.52, SD=.21) than did participants in the low-arousal condition (M=2.80, SD=.12, $t(116)$=2.94, p=.004, d=.541, $CI_{95\%}$=[.24, 1.21]).

Bids and final prices. A 2 (arousal: low, high) x 2 (stakes: low, high) repeated measures analysis of covariance (ANCOVA) on participants' standardized bids with auction order as a covariate, led to a significant main effect for arousal ($F(1, 116)=10.90$, $p=.001$, $\eta^2_p=.087$, $CI_{95\%}=[.21, .83]$). Participants in the high-arousal condition ($M=.26$, $SD=1.04$) bid significantly higher than those in the low-arousal condition ($M=-.26$, $SD=.88$). The arousal x stakes interaction ($F(1, 116)=.78$, $p=.38$, $\eta^2_p=.007$) and the auction order covariate ($F(1, 116)=.00$, $p=.952$, $\eta^2_p<.001$) were not significant.

We also assessed whether arousal affected final prices. A 2 (arousal: low, high) x 2 (stakes: low, high) repeated measures ANCOVA on standardized final prices with auction order as a covariate found that high-arousal ($M=.21$, $SD=1.11$) led to marginally higher standardized final prices than low-arousal ($M=-.21$, $SD=.82$) did ($F(1,45)=3.44$, $p=.070$, $\eta^2_p=.024$). Neither the arousal x stakes interaction ($F(1, 45)=.01$, $p=.931$, $\eta^2_p<.001$) nor the auction order covariate ($F(1, 45)=.61$, $p=.438$, $\eta^2_p=.004$) were significant. On average, the difference between the high- and low-arousal conditions was €.46 and €.96 in the low- and high-stakes conditions (19.4% and 8.1% of the value of the jar) respectively. [4]

Consistent with our theorizing, Experiment 1 showed that incidental arousal increased bidding in auctions with real monetary consequences. Importantly, we provided clear evidence that our manipulation induced arousal by using a well-established measure of sympathetic activation of the autonomous nervous system.

Experiment 2: Non-Competitive, Incidental Arousal in Auctions

Although Experiment 1 manipulated incidental arousal, it still focused on competitive experiences, i.e., arousal may have resulted from the social competition in the manipulation. To test whether arousal that was unrelated to both competition and auctions would still influence

bidding, we sought a manipulation that was both distal from the auction context and as subtle as possible. Thus, Experiment 2 induced cognitive dissonance.

When people act in a way that contradicts their beliefs, they experience cognitive dissonance, which is a state of psychological discomfort, tension, or arousal (Cooper & Fazio, 1984; Elkin & Leippe, 1986; Festinger, 1957; Kiesler & Pallak, 1976). Importantly, research demonstrated that experiencing cognitive dissonance increases nonspecific skin conductance, a physiological measure of arousal (Croyle & Cooper, 1983; Elkin & Leippe, 1986; Losch & Cacioppo, 1990). Additionally, dissonance influences task performance in ways similar to other arousal states (Cooper, Zanna, & Taves, 1978; Pallak & Pittman, 1972; Zanna & Cooper, 1974). Thus, leveraging off this research, we induced cognitive dissonance in participants to create incidental arousal.

Because the perception of choice in performing a counterattitudinal behavior is a key driver of dissonance and the arousal that results from it (Cooper & Fazio, 1984; Croyle & Cooper, 1983), Experiment 2 manipulated whether participants had the choice to engage in counterattitudinal advocacy, after which they bid in Experiment 1's low stakes (€2.37) auction. We hypothesized that the arousing cognitive dissonance from having choice in writing a counterattitudinal essay would increase bidding.

Method

Participants and design. We used the ORSEE system (Greiner, 2015) to recruit 150 undergraduates (102 men, 48 women) at a German university. Participants were compensated €12 plus their individual earnings from the auction task. The experiment had two between-participants conditions: no vs. high choice in writing a counterattitudinal essay. Five participants in the high-choice condition refused to write the essay, resulting in a final sample of 145 undergraduates (101 men; 44 women).

Procedure. As in Experiment 1, participants sat at isolated cubicles with computer monitors, were introduced to the auction task, and bid in one trial auction with hypothetical payoffs and computerized opponents.

Next, as part of the dissonance induction, we asked participants for their opinions on the issue of introducing tuition fees. This issue was topical, familiar, and commonly debated. Participants indicated whether they were for or against tuition fees and reported how strongly they held their opinion (from 1 "not at all" to 7 "very much so"). Next, they all wrote a counterattitudinal essay, i.e., those who supported tuition fees wrote against them and vice versa.

Dissonance induction. We induced dissonance by manipulating whether participants had a choice in writing their counterattitudinal essay (Cooper & Fazio, 1984; Croyle & Cooper, 1983). *No-choice instructions* indicated, "You have been assigned to write a list of arguments in favor of/against [depending on their initial opinion] introducing tuition fees of €750 per semester for each student. Therefore, you must argue in support of/against introducing tuition fees." The *high-choice instructions* indicated, "While we would like to stress the voluntary nature of your decision regarding which side of the issue to write on, we would like you to list arguments in favor of/against introducing tuition fees of €750 per semester for each student. Although you are under no obligation to write this, it would be very helpful for us." High-choice participants provided written consent to confirm their willingness to write the essay. All essays started with: "I believe that the State of Baden-Württemberg should/should not introduce tuition fees of 750 € per semester for each student because …".

Finally, participants bid in one auction against two other participants, for the jar of 1- and 2-cent coins, worth €2.37.

Bids and final prices. We recorded participants' bid, and because participants bid within three-person groups, we also calculated the auction final price.[5]

Results and Discussion

Most participants (122; 84%) were opposed to introducing tuition fees. When controlling for participants' initial opinions, all effects listed below remain significant; for simplicity, we report results without this covariate.

As predicted, high-choice participants (M=€1.98, SD=€.86) bid higher than no-choice participants (M=€1.62, SD=€.74) did ($t(143)=2.74$, p=.007, d=.46, $CI_{95\%}$=[.10, .62]). We found the same pattern for final prices: high-choice (M=€2.75, SD=€.67) led to higher final prices than no-choice (M=€2.38, SD=€.55) did ($t(48)=2.14$, p=.038, d=.61, $CI_{95\%}$=[.22, .72]).

Experiment 2 provided clear evidence that arousal that is unrelated to competition, and as distal as cognitive dissonance, can increase bidding and final prices.

Experiment 3: Awareness of the Effects of Non-Competitive, Incidental Arousal

Experiments 1 and 2 showed that two different operationalizations of incidental arousal increased bidding and final prices (marginally in Experiment 1 and significantly in Experiment 2). Using a third manipulation of incidental arousal, Experiment 3 examined whether bidders are aware of arousal's effects (Bazerman & Sezer, 2016).

Method

Participants and design. We recruited 369 participants (105 men, 264 women) who resided in England through Prolific Academic in exchange for £1.00. Prolific Academic is a reliable online recruitment pool with participants who are more honest and naïve to common measures than other online platforms (Peer, Samat, Brandimarte, & Acquisti, 2017). Data from 108 participants who failed attention checks[6] were excluded. Based on an outlier analysis, data from 26 participants were excluded because their bids deviated more than 1.5 times the interquartile range from the upper quartile. The final sample included 235 participants (62 men; 173 women). The experiment had two between-participants conditions: low vs. high arousal.

Procedure. The procedure mimicked that of Experiments 1 and 2 but participants bid online. They were informed that we were interested in understanding individuals' abilities to multi-task, which provided a cover story as participants switched between tasks. As a sound test, participants first answered two questions with audio instructions. To increase engagement and to simulate the presence of other bidders, participants were asked to create a bidder profile by selecting a bidder name and avatar. As in Experiments 1 and 2, participants were next introduced to the auction task, and bid in one trial auction with hypothetical payoffs and computerized opponents. They were then informed that they would be bidding in a real auction, against 2 actual bidders and with real payouts. In reality, participants simply submitted bids without the opportunity to actually interact with other bidders or win the auction.

Arousal induction. We next manipulated arousal by asking participants to engage in an "image recognition task" that involved viewing and subsequently recognizing 14 images[7] selected from Kurdi et al.'s (2017) Open Affective Standardized Image Set (OASIS) while listening to music (Bernardi et al., 2005; Gorn et al., 2001). Each image was shown for 5 seconds, with a 1-second blank screen between images, resulting in a 90-second task. We chose to manipulate arousal via both images and music to provide a strong manipulation, given the online setting. The *low-arousal condition* included images of stationery, walls, pebbles, and Q-tips, as well as Experiment 1's calming music. The *high-arousal condition* included images of fire, lighting, injuries, a roller coaster ride, a shark, and a kissing couple as well as Experiment 1's energetic music.

Auction. Participants then returned to the bidding task where they saw a picture of a jar (with dimensions) of 1 pence coins. Unbeknown to participants, the jar contained £.82. Next, on the bidding screen, the image of the jar was repeated, together with two bidder profiles of the ostensible opponents. Participants were asked to indicate a bid for the money in the jar.

Measures. To understand participants' bidding rationale, they were asked, in an open-ended question, to describe the factors that affected their bid decision. Participants also responded to 10 questions (from 1 "not at all" to 7 "very much so") about what they thought about and focused on during their bidding. These questions included items about the image recognition task as well as items on bidding motives commonly identified in extant literature (see Table 1 for items). We conducted a principal components factor analysis with varimax rotation. Four items loaded onto the first factor (27.56% of variance) and were averaged to form an index about winning (α=.85). Three items loaded onto the second factor (20.72% of variance) and were average to form an index about the image recognition task (α=.77). Although the three remaining items formed the final factor (14.06% of variance), they showed poor inter-item reliability (α=.36) and were analyzed separately.

Next, participants described their emotions during the image recognition task using 4 items on 7-point scales ("very calm"/"very aroused", "very peaceful"/"very energized", "very inactive"/"very active", and "very unhappy"/"very happy"). The first three items were average to form an arousal index (α=.75).

Finally, participants answered 6 questions to determine if they recognized the images and music from the manipulation as well as 1 question about their bidding counterparts in the money auction (e.g., 2 or 3 bidders, computers or human). Participants were then informed that they lost the auction and responded to demographic questions.

Results and Discussion

Manipulation check. As predicted, high-arousal participants (M=3.71, SD=.99) reported feeling more aroused, energized, and active than low-arousal participants (M=2.54, SD=.97) did ($t(1, 233)=9.21$, $p<.001$, d=1.20, $CI_{95\%}$=[.92, 1.43]). Because high-arousal participants (M=3.55,

SD=.95) also reported feeling less happy than low-arousal participants (*M*=4.52, *SD*=.87) did ($t(1, 233)=8.16$, $p <.001$, $d=1.06$, $CI_{95\%}=[-1.20, -.73]$), our main analyses controlled for the effects of happiness to isolate the manipulation's effect on arousal.

Main analyses. First, and consistent with Experiments 1 and 2's findings, high-arousal participants (*M*=.90, *SD*=.71) bid more for the jar of coins than low-arousal participants (*M*=.81, *SD*=.65) did ($F(1, 232)=4.67$, $p =.032$, $\eta^2_p=.02$, $CI_{95\%}=[.02, .41]$).

We also wanted to examine individuals' awareness of how incidental arousal affected their bidding. The first two authors coded participants' open-ended responses to the factors that affected their bidding (see Table 2 for categories, sample responses, and instances of mention by condition), resolving any discrepancies through discussion. With a series of logistic regressions while controlling for participants' happiness, we found no significant differences in how often each factor was mentioned by participants in the low- and high-arousal conditions (all Wald's<2.44, *p*'s>.12). Interestingly, no one mentioned their emotions or the image recognition task.

Finally, we analyzed participants' responses to the questions on what they thought about and focused on during bidding (see Table 1 for descriptive statistics). While controlling for the effects of happiness, high-arousal participants were marginally less likely to focus on estimating the value of the coins than low-arousal participants were ($F(1, 232)=3.42$, $p =.066$, $\eta^2_p=.02$, $CI_{95\%}=[-.02, .64]$). Low- and high-arousal participants did not differ on any of the other factors (all *F*'s<.2.49, *p*'s>.12), including the image recognition task. Indeed, both low- (*M*=2.14, *SD*=1.24) and high- (*M*=2.25, *SD*=1.28) arousal participants rated the image recognition task as having very little effect on their bidding and the image recognition task was the least considered category.

With a third manipulation of incidental arousal, Experiment 3 demonstrated again that incidental arousal increases bids. However, novel to Experiment 3, we showed that participants were unaware of the impact of incidental arousal.

General Discussion

Despite anecdotes about emotionally-charged bidding, little research has explored the causes and persistence of auction fever. Because previous research has only focused on integral arousal, the current research considered whether incidental arousal also increases bidding. Consistent with our hypotheses, we demonstrated that incidental arousal increases bidding (Experiments 1-3) and final prices (marginally in Experiment 1 and significantly in Experiment 2). Additionally, Experiment 3 demonstrated that individuals were unaware of the effects of incidental arousal. Importantly, Experiments 1 and 2 involved real auctions with monetary stakes and Experiment 1 measured arousal physiologically.

Theoretical Contributions and Future Research

The current research contributes to our theoretical understanding of the role of arousal in auction bidding. First, we show that incidental arousal, like integral arousal, increases bidding. Thus, although Ku, et al. (2005) focused on arousal from auction-related features (e.g., time pressure, rivalry), our research clarifies that arousal-induced bidding can emerge from non-auction sources and even from arousal that has nothing to do with competition, i.e., cognitive dissonance (Experiment 2) as well as images and music (Experiment 3). Second, consistent with much research that shows that individuals are often unaware of relevant factors and information that affect their decisions (Bazerman & Sezer, 2016), we show that individuals are unaware of the effects of incidental arousal on bidding. Together, the current research helps to explain what causes auction fever and why it persists – individuals can be subject to a host of arousal sources

that are unrelated to the auction, which increase their bidding without their awareness, making avoiding the effects of arousal ever more difficult.

Although not central to our hypothesizing, it is noteworthy that our research also provides the first causal evidence that arousal affects auction bidding. Despite anecdotal evidence about auction fever, there is actually no conclusive evidence for a causal relationship between arousal and bids. By manipulating incidental arousal, we were able to demonstrate that arousal increases bidding. Additionally, only one paper has used physiological measurements to analyze the role of arousal in auction fever (Adam et al., 2015). By measuring arousal physiologically, we provide further evidence for the role of arousal in auction fever. As such, our research also clarifies that auction fever is a psychologically valid phenomenon.

Despite basing our theorizing on the competitive arousal model's perspective that arousal impairs bid decisions (Ku et al., 2005), our research is unable to specify an exact mechanism for *how* arousal affects bidding. At a high level, arousal should guide bidders by allowing them to anticipate the potential gains and losses associated with bids (Bechara & Damasio, 2005; Bechara et al., 1997). However, at a more detailed level, we do not know how exactly arousal impacts bid decisions. Does arousal alter risk taking (Mano, 1991) or how bidders process information (Lewinsohn & Mano, 1993)? For instance, in Experiment 3, participants in the high-arousal condition were marginally less likely to focus on estimating the value of the coins than were low-arousal participants, suggesting that high arousal altered information processing.

Alternatively, much research has shown that arousal affects individuals through an attributional process, where people attribute their arousal to environmental stimuli, even *non-causal* environmental stimuli (Dutton & Aron, 1974; Schachter & Singer, 1962). Thus, in auctions, arousal could affect bidding, not through an impairment process (Ku et al., 2005), but through an attributional process. Two attributional processes can be hypothesized. On one hand,

arousal could be attributed to interest in the item (e.g. Dutton & Aron, 1974; White et al., 1981), which could then increase willingness-to-pay (WTP) for the item. On the other hand, arousal could be attributed to elements in auctions, which inherently involve social competition for a scarce resource. Answering these attributional questions would not only clarify how arousal affects bidding but may also help to clarify whether the "fever" in auction fever represents a more general form of purchasing fever or whether it is specific to auctions.

Practical Contributions

Practically, auction organizers should do all that they can to stimulate arousal as any form of arousal can increase bidding. Auction organizers may already be aware of this. Thoroughbred auctions, for instance, hype the event via glamour (people wear tuxedos and formal gowns), employ bid spotters who roam the crowd, and use social pressure to encourage additional bidding. Our research suggests that auction organizers may also consider other ways of inducing (incidental) arousal, such as arousal-inducing beverages and upbeat music.

From the bidder perspective, future research should consider how to help individuals avoid auction fever. For instance, because arousal can be attributed to non-causal stimuli (Dutton & Aron, 1974), bidders could learn to attribute their arousal to alternate sources, and therefore, not overbid. Biofeedback may also help individuals to be aware of their arousal levels and avoid undesirable decisions (Astor, Adam, Jerčić, Schaaff, & Weinhardt, 2013).

Conclusion

The current research demonstrated that incidental arousal, even arousal that had nothing to do with competition, increased bidding in auctions, without individuals' awareness. As such, we help to explain what causes auction fever and why it persists.

Table 1

Means (and Standard Deviations) for Questions on what Participants Thought about and Focused on During the Bidding

Index	**Items**	**Low Arousal**	**High Arousal**
Winning	I focused on winning the money auction; I focused on beating the other bidders; I focused on not losing the money auction; it was important to me to not lose the money auction	4.40 (1.54)	4.20 (1.42)
Image recognition task	My emotions from the image recognition task affected my bid decision; I focused on how the image recognition task made me feel; I focused on remembering the images from the image recognition task	2.14 (1.24)	2.25 (1.28)
	I focused on estimating how much money was in the jar	6.15 (1.05)	5.82 (1.22)
	I was just guessing at a bid	3.62 (1.67)	3.44 (1.59)
	I focused on not paying too much	4.95 (1.77)	4.98 (1.64)

*Note***.** Participants indicated the extent to which the items affected their bidding on 7-point scales (1 “not at all” to 7 “very much so”).

Table 2

Participants' Open-Ended Responses to Factors that Affected their Bidding

Category	**Sample Response**	**Low Arousal (N=122)**	**High Arousal (N=113)**
Estimation of coins' value	There did not appear to be much money in the jar	113 (92.6%)	103 (91.2%)
Estimation of jar's value	I think there's around £1 in the jar and the jar also looks nice	15 (12.3%)	11 (9.7%)
Rarity of object	For pennies – I thought that some may be collectable	2 (1.6%)	0 (0.0%)
Desire to win the auction/beat the other bidders	How much money I thought was in the jar, and going fairly close to it to try and win	11 (9.0%)	16 (14.2%)
Desire to not overbid/retain a surplus	No. of coins visible, desire to make a profit	46 (37.7%)	33 (29.2%)
Just guessing	Just a guess at the amount	3 (2.5%)	1 (.9%)
Strategic bidding taking into account others' bids	Estimated value of what item was worth. Tendency to go to round numbers so I added 1p.	3 (2.5%)	10 (8.8%)
Lack of interest in item	Wasn't worth bidding on.	1 (.8%)	3 (2.7%)
Other	Idk [I don't know.]	5 (4.1%)	1 (.9%)

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Endnotes

[1] Some research has examined the effects of incidental moods on bidding, finding that positive moods increase bids compared to negative moods (Capra, Lanier, & Meer, 2012; De Silvaa, Pownall, & Wolk, 2012). However, there has been no research examining the effects of incidental arousal on bidding, which is the focus of the current research.

[2] We determined the sample size for Experiments 1 and 2 using GPower (Faul, Erdfelder, Lang, & Buchner, 2007). Assuming an effect size of d=.50, alpha=.05, and power=.80, the analysis indicated a sample of 128 participants. No additional participants were run after initial analyses. Experiment 1 included a fixed number of 24 data collection sessions with 6 participants each (12 sessions per condition; 144 participants in total). For Experiment 2, we anticipated that a small number of participants would refuse to write the counterattitudinal essay in the *high-choice* condition. Thus, we included 13 sessions for the *high-choice* condition. For Experiment 3, we assumed a smaller effect size of d=.40 (given the online setting), alpha=.05, and power=.80, which indicated a sample size of 200. We needed to recruit additional participants after initial analyses because numerous participants failed the attention checks.

[3] Participants also completed a questionnaire about their perceptions of the auction as well as various scales (e.g., risk preferences, competitiveness). Additional information about these data is available from the authors by request.

[4] We conducted a mediation analysis to explore whether arousal as measured by CSI mediated the effect of the incidental arousal manipulation on bids. Using Hicks and Tingley's (2011) MEDEFF macro in Stata 14 (which uses robust standard errors clustered by participant to account for the repeated measures nature of the stakes variable), the analysis did not yield a significant indirect effect of arousal (IE=-.046, LL=-.163, UL=.028). The reason for this is

unclear but might be explained by the between-participants variability of the CSI measure or the proximity of the mediator to the independent variable.

[5] Participants also provided information about their risk preferences and attitude certainty. Additional information about these data is available from the authors by request.

[6] We used two attention checks. First, participants needed to correctly identify the number and identity of their bidding counterparts in the auction for the jar of coins, i.e., bidding against two actual bidders. Second, participants needed to correctly respond to at least five (of six) questions asking about the images and music they saw and heard in the arousal manipulation.

[7] Image identifiers used in the *low-arousal* condition were: I95, I181, I182, I587, I590, I595, I597, I602, I673, I859, I860, I861, I862, I863 (Kurdi et al.'s (2017) reported arousal: M=1.83, SD=.04; valence: M=4.09, SD=.07). Image identifiers used in the *high-arousal* condition were: I306, I322, I328, I440, I473, I475, I477, I479, I496, I535, I676, I727, I827, I849 (Kurdi et al.'s (2017) reported arousal: M=4.98, SD=.31; valence: M=3.34, SD=1.42).