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Intuition speed as a predictor of choice and confidence in point spread predictions

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Abstract

Previous research has revealed that intuitive confidence is an important predictor of how people choose between an intuitive and non-intuitive alternative when faced with information that opposes the intuitive response. In the current study, we investigated the speed of intuition generation as a predictor of intuitive confidence and participant choice in choice conflict situations. Participants predicted the outcomes of several National Basketball Association games, both with and without reference to a point spread. As hypothesized, the faster participants were to predict the outright winner of a game (i.e., generate an intuition) the more likely they were to predict the favourite against the point spread for that game (i.e., endorse the intuitive response). Overall, our findings are consistent with the notion that the speed of intuition generation acts as a determinant of intuitive confidence and a predictor of choice in situations featuring equally valid intuitive and non-intuitive alternatives.

Keywords: dual-process, intuition confidence, intuition speed, sports gambling

1 Introduction

While we often hold our intuitions in high regard, there are times when our intuitions conflict with other information presented to us. For example, a person may have a "good" feeling about an investment that is deemed unfavourable by their financial advisor or wish to go see a movie that has received negative reviews online. How do people decide between intuitive and non-intuitive alternatives when faced with information that conflicts with their intuitive choice? Past research has demonstrated that people are frequently biased towards endorsing intuitive alternatives, even when faced with information that opposes this choice (Denes-Raj & Epstein, 1994; Kirkpatrick & Epstein, 1992; Risen, 2016; Simmons & Nelson, 2006; Simmons, Nelson, Galak & Frederick, 2011). This bias towards intuitive alternatives has been shown to play a role in various decision-making biases such as, ratio-bias (also called "denominator neglect"; Denes-Raj & Epstein, 1994; Denes-Raj, Epstein & Cole, 1995), the spotlight effect (Gilovich, Medvec & Savitsky, 2000), above- and below-average effects (Kruger, 1999), and more (for reviews, see Epstein, 1994; Gilovich, Griffin & Kahneman, 2002; Kahneman, 2003). Additionally, peoples' preferences for intuitive alternatives has been demonstrated to lead to sub-optimal choices in various incentivized domains, such as the domain of gambling (Simmons & Nelson, 2006; Simmons et al., 2011; Walker, Stange, Fugelsang, Koehler & Dixon, 2018).

According to dual-process theories, intuitive biases result from an interplay between Type 1 and Type 2 processes (Evans & Stanovich, 2013; Kahneman, 2011), with Type 2 processes failing to intervene (or intervene sufficiently) with an intuitive Type 1 response (Cacioppo & Petty, 1982; Epley & Gilovich, 2004, 2006; Tversky & Kahneman, 1974). Simmons and Nelson (2006) theorized that two factors are relevant to resolving the conflict between intuitive (Type 1) and non-intuitive (Type 2) responses: (1) The degree of confidence people have in their current intuition (i.e., intuitive confidence), and (2) the strength of information opposing this intuition. Consistent with this claim, they were able to demonstrate that people are more likely to choose in accord with their intuition when choice situations produce confidently held intuitions and less likely to endorse their intuition when the information that opposes their intuition is strong. Thus, according to Simmons and Nelson, intuitive biases arise frequently because people often hold their intuitions with a high degree of confidence against opposing information that is deemed insufficiently strong. Consequently, if intuitive confidence is undermined, peoples' bias towards selecting in line with their intuition should disappear. The current paper seeks to expand upon this account by investigating how the speed in which an intuition is generated relates to how confidently that intuition is held and the likelihood that it is endorsed in a choice conflict situation.

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1.1 Investigating choice using point spread predictions

Like Simmons and Nelson (2006), the current study chooses to investigate choice under conflict within the domain of sports betting. Specifically, participants were asked to make predictions against a point spread, a type of sports betting in which bettors attempt to predict the winner of a game while accounting for the fact that a pre-specified number of points (i.e., the point spread) will be subtracted from the favoured team (i.e., the team deemed most likely to win the game). Point spread predictions are suitable for investigating choice under conflict as for each game participants must choose between an intuitive (i.e., the superior team or "favourite") and non-intuitive alternative (i.e., the inferior team or "underdog"), while considering a point spread that attempts to equate the validity of both alternatives.[1] In order to understand how point spreads attempt to equate the validity of predictions in favour of teams with varying degrees of skill and success, consider the following example. Imagine the Toronto Raptors are playing the Orlando Magic in an upcoming National Basketball Association (NBA) game. Now imagine that the Raptors are having a good year and have won the majority of the games they have played thus far (i.e., 35 out of 50) while the Magic have not (i.e., 15 out of 50). Since the past performances of both teams suggest that the Raptors are likely to come out victorious, a point spread is introduced in attempt to ensure that a bet placed on the Magic has an approximately equal chance of being successful. This can be accomplished, for example, by having the Raptors favoured by a point spread of 10 points. This means that a bet placed on the Raptors is declared a winner if the Raptors win by more than 10 points, whereas, a bet placed on the Magic wins if the Raptors win by less than 10 points or if the Magic win the game (if the Raptors win by precisely 10 points neither bet is declared a winner). Thus, even though in our example the Raptors may be likely to win the game, a properly set point spread will ensure that a bet on the Raptors against the spread will have approximately the same chance of being successful as a bet on the Magic due to the introduction of scenarios where the Raptors can win the game but fail to beat the point spread.

In the current study participants were asked to predict the outcome of several NBA games. Some trials asked participants to predict the winner of a game without reference to a point spread while other trials introduced a point spread and had participants predict the winner of a game against this point spread. Predicting the winner of a game (hereby referred to as a WIN prediction) is relatively simple and often involves little to no conflict as participants' only goal is to attempt to identify the stronger team. However, predicting the winner of a game against a point spread (hereby referred to as an ATS prediction) is more complex as the point spread equates the likelihood of either team "winning" in the context of a bet by subtracting points from the favoured team. Therefore, for ATS predictions, an intuitive assessment of which team is stronger needs to be balanced against the magnitude of the point spread.

[1] Contrary to popular belief, point spreads are not set to equate the amount of money bet on favourites and underdogs but rather set to maximize profits (Levitt, 2004; Paul & Weinbach, 2008). A review of the NBA gambling market for the 2004–05 to 2006–07 seasons by Paul and Weinbach (2008) demonstrated that this goal leads to more money being wagered on favourites but results in roughly equal outcomes for both favourite and underdog predictions (underdogs were found to win against the spread 50.678% of the time).

1.2 Speed as a determinant of intuitive confidence

According to dual-process theories, people often answer difficult questions by substituting in an easier but related question (Kahneman & Frederick, 2002). Thus, when faced with having to make a prediction against a point spread in a sports betting task people may opt to make this prediction by first making a simpler prediction, that is, a prediction regarding which team will win the game. When making this easier prediction ("Who will win the game?") the favourite often springs to mind quickly and effortlessly resulting in an, often confidently held, intuition for predicting the favourite. Applying Simmons and Nelson's (2006) intuitive confidence theory to point spread predictions one would expect that the more confident a person is in the favoured team winning the game, the more likely they would be to endorse the favoured team against a point spread. Furthermore, we would expect that, all else being equal, the larger the point spread magnitude the less likely people will be to endorse the favourite against the point spread. These predictions were supported across a variety of experiments all of which had participants making point spread predictions. For example, Simmons and Nelson (2006) found that when participant's confidence in their prediction of the winner (the "favourite") was high, they were more likely to choose the favourite against their own self-generated point spreads; however, when confidence in the prediction of the winner was low, no consistent preference for choosing favourites against the point spread emerged. Furthermore, in a set of additional studies featuring published point spreads, participants were found to be less likely to choose favourites against the point spread as the size of the point spread increased. Therefore, Simmons and Nelson's data indicate that, when confidence in an intuition is high, the intuitive choice is likely to be chosen, even when undermined by another piece of information (e.g., a point spread). Conversely, when confidence is low, the non-intuitive alternative may be chosen given that information opposing the intuitive choice is sufficiently strong.

While Simmons and Nelson (2006) demonstrated the relation between intuitive confidence and participant choice, the determinants of intuitive confidence remain unclear. One potential determinant of intuitive confidence is how quickly and easily an intuition springs to mind. Speaking to this possibility, previous studies have demonstrated a link between fast, fluent memory retrieval and confidence (Kelly & Lindsay, 1993; Morris, 1990; Nelson & Narens, 1980), with people reporting more confidence in answers they retrieved quickly. Additionally, other studies have demonstrated the impact of metacognitive experiences (such as disfluency) on peoples' choices in a variety of contexts (Alter, Oppenheimer, Epley & Eyre, 2007; Haddock, Rothman, Reber & Schwarz, 1999). According to Thompson, Turner and Pennycook (2011), intuitions are accompanied by a metacognitive feeling-of-rightness (FOR) which help determine the extent and outcome of analytic engagement. Consistent with these claims, Thompson and colleagues were able to demonstrate how participants' self-reported FOR in an initial speeded response predicted how long participants spent rethinking this initial response and how likely they were to change their response when given the opportunity. Precisely, intuitive responses accompanied by strong FORs were likely to lead to less analytic engagement and fewer response changes compared to intuitive responses that were accompanied by weak FORs. Importantly, the speed with which an intuitive response was produced was shown to be a determinant of FOR as fast intuitions were more likely to elicit strong FORs. The current study seeks to examine whether the speed with which an intuition is generated is associated with the confidence with which it is held and the likelihood that it is endorsed over an equally valid non-intuitive alternative. If this is the case, the speed of intuition generation can be said to play an important role in determining the likelihood of intuitive responding, either alongside or in place of intuitive confidence.

1.3 The current study

Previous studies have demonstrated how fast intuitions relate to a metacognitive FOR, which in turn help determine the level of analytic thinking that will be engaged for the given problem (Thompson et al., 2011). Furthermore, intuitive confidence and the strength of information opposing the intuitive alternative has been shown to be a strong predictor of choice under conflict (Simmons & Nelson, 2006). The goal of the current study is to expand on these previous findings by examining the relation between the speed at which participants arrive at an intuitive choice (i.e., make a WIN prediction), the confidence they have in their intuitive choice, and the choices they make when choosing between equally valid intuitive and non-intuitive alternatives (i.e., when making ATS predictions). First, we predict that WIN prediction response times will have a negative relation with intuitive confidence such that games featuring confident WIN predictions will be more likely to also feature fast WIN predictions. Next, we hypothesize that the speed of intuition generation (i.e., WIN prediction response times) will be a significant predictor of ATS predictions. That is, we predict that the faster participants are able to predict the winner of a game, the more likely they will be to predict the favourite against the point spread for that game.

2 Method

2.1 Participants

A sample of 330 participants were recruited from Amazon Mechanical Turk. Participants were recruited under the condition that they be U.S. residents and possess a Mechanical Turk HIT approval rate greater than or equal to 95%. The present study took approximately eight minutes to complete and participants were compensated $1.00 for their participation.

2.2 Materials and procedure

Participants completed an online questionnaire where they were randomly assigned to one of four conditions. Each condition was identical with the exception that each condition featured a unique set of 11 NBA games for which participants were asked to predict the outcomes. Thus, the present experiment featured a pool of 44 NBA games which were divided into four subsets of 11 games, for which each participant made predictions on only one of these 11 game subsets. The 44 NBA games utilized in this experiment had been previously played between February 19th, 2015 and February 25th, 2015. This date range was chosen as it ensured that each team had played a minimum of 50 games during the current NBA season and thus that their quality could be reliably demonstrated through various statistics (e.g., win-loss record).

The point spreads presented alongside these games were artificial point spreads that were calculated via a regression analysis. We chose to use artificial, as opposed to authentic, point spreads to ensure that only the data presented to participants (i.e., win-loss record, points scored per game, and points allowed per game) would influence a game's point spread, as opposed to factors not provided to participants, such as a recent injury to a star player. The artificial point spreads used in this experiment were the unstandardized predicted values obtained from a regression analysis featuring authentic point spreads[2] as the dependent variable along with three independent variables calculated from relevant NBA statistics. These three independent variables were as follows: Win percentage difference (Home team win percentage − Visiting team win percentage), points scored difference (Home team points scored per game − Visiting team

[2]Authentic point spreads were retrieved from the website http://www.donbest.com.

	Home Team		**Visiting Team**	
Record	30–23		20–33	Record
Points Scored Per Game	99.2		100.7	Points Scored Per Game
Points Allowed Per Game	97.2		104.1	Points Allowed Per Game

FIGURE 1: Cue table presented to participants. Values in table represent an example of the cues provided for one game.

points scored per game) and points allowed difference (Home team points allowed per game – Visiting team points allowed per game). Games that generated a point spread less than 1.5 were not included in the present experiment due to these games lacking a decisive favourite. Following the removal of such games, we arrived at a set of 44 NBA games that were featured in the present experiment.

Prior to making any predictions, participants completed a point spread tutorial that informed them how point spreads operate in a sports betting domain. To ensure that each participant understood this knowledge, two questions were administered following the point spread tutorial. Each question required that participants correctly select the winner of a bet made against a point spread. Only the 248 participants who correctly answered both questions were able to proceed in this experiment.

This experiment featured a within-subjects design in which participants were asked to make both WIN ("Which team do you believe will win the game?") and ATS (Which team do you believe will win against the spread?") predictions for each of the 11 NBA games presented to them. Importantly, participants did not make both WIN and ATS predictions simultaneously for any particular game, rather, both WIN and ATS predictions were elicited on separate trials which were intermixed and presented in a randomized order. Immediately following each prediction, participants were asked to rate their confidence in their prediction on a 9-point scale ranging from 1 (*not at all*) to 9 (*extremely*). Each confidence judgment was elicited on a separate page as to not interfere with our recording of participants' WIN and ATS prediction response times. Therefore, WIN and ATS prediction response times assessed only how long participants took to make either a WIN or ATS prediction (i.e., no other responses were elicited concurrently). Three statistical cues, presented in a table format, informed participants' predictions, as these cues highlighted the overall quality of the otherwise anonymous teams (Figure 1). The presented cues were as follows: 1) Record 2) Points Scored Per Game and 3) Points Allowed Per Game. These cues informed participants of the frequency of wins and losses for an anonymous team (Record), the quality of a team's offense (Points Scored Per Game) as well as the quality of a team's defense (Points Allowed Per Game). A summary of all statistics presented to participants for our complete set of 44 NBA games, along with our full list of items (including the point spread tutorial), can be viewed in our Supplement. Following all prediction trials, participants were asked to complete four Cognitive Reflection Test items designed to assess their proclivity for reflective as opposed to intuitive thinking as well as were asked to self-report their level of NBA knowledge and whether they attended to the "Home Team" label when making their predictions. These items were collected for purposes peripheral to the main objective of the current study and as such all analyses involving these items are reported in our Supplement.

3 Results

3.1 Favourite bias

Replicating the findings of past research (Paul & Weinbach, 2008; Simmons & Nelson, 2006), participants demonstrated a preference for predicting favourites against the point spread, doing so 64.4% of the time. This percentage was significantly greater than the chance expectation of 50% ($t(43) = 6.11$, $p < .001$). Furthermore, this preference resulted in favourites being predicted against the spread by the majority of participants for 34 out of 44 games, which was greater than the chance expectation of 22 out of 44 games ($t(43) = 4.27$, $p < .001$). However, in our sample of 44 NBA games favourites won against our presented point spreads 59.1% of the time (i.e., in 26 out of 44 games; this was not greater than the chance expectation, $t(43) = 1.21$, $p = .232$). Thus, it is possible that participants' observed favourite bias may have been due in part to participants correctly perceiving favourites to be the superior ATS prediction, on average, in our sample of NBA games. Nevertheless, contradicting this possibility, the actual outcome of games was found to be unrelated to the proportion of favourites chosen against the spread across our sample of games ($r(42) = -.13$, $p = .389$). Furthermore, this non-significant association was observed to be trending in the direction of games being more likely to feature a greater proportion of underdog predictions against the point spread when the actual outcome of the game had the favourite winning against the point spread.

3.2 Intuition speed as a predictor of choice and confidence

To evaluate the validity of our main hypotheses we conducted multiple item-based (as opposed to participant-based) anal-

Table 1: Item level zero-order correlations.

	M	*SD*	1	2	3	4
1. WIN prediction RT	0.88	0.04	.			
2. Intuitive Confidence	6.47	0.70	−.54***	.		
3. Point Spread Magnitude	5.33	2.93	−.28	.64***	.	
4. ATS Predictions	0.68	0.16	−.36*	.19	−.43**	.

Note. Pearson correlations between all key item-level variables in Study 1. All analyses reported in this table utilized item-level data in which all observations where a participant predicted the underdog during a WIN prediction were removed. *WIN Prediction RT* = The mean value of $\log^{10}$ response times calculated for each WIN prediction; *ATS Predictions* = The proportion of participants predicting the favourite against the spread calculated for each ATS prediction. *** $p < .001$, ** $p < .01$, * $p < .05$.

yses, with the 44 NBA games as the units of analysis. This approach was utilized previously by Simmons and Nelson (2006) who were similarly interested in how various characteristics of items (i.e., games) predicted participant choice in a point-spread prediction task. First, we examined the relation between WIN prediction response times[3] and intuitive confidence (i.e., WIN prediction confidence ratings). We hypothesized that a negative relation would be observed between WIN prediction response times and intuitive confidence, such that games featuring fast WIN predictions would be more likely to elicit confident WIN predictions. This hypothesis was supported; WIN prediction response times were negatively associated with intuitive confidence ($r(42) = -.47$, $p = .001$).

Second, we examined the relation between the speed of WIN predictions and participant choice, specifically when making ATS predictions. We hypothesized that the faster participants generated an intuition (i.e., made their WIN prediction) for a particular game the more likely they would be to choose in line with this intuition in the face of information opposing their intuitive choice (i.e., predict the favourite for that game against the spread). As this account depends on participants viewing the favourite as the intuitive choice, we removed from the following analyses all instances in which the underdog was predicted to defeat the favourite during a WIN prediction which resulted in 326 observations removed (see the Supplement for a breakdown of exclusions by game). This is necessary for our analyses, as when participants view an underdog as the intuitive choice to win a particular game the presented point spread serves only to bolster, instead of hinder, choosing in line with this intuition during the ATS prediction. Table 1 shows a correlation table reporting all zero-order associations between key variables, with these observations removed. In support of our hypothesis, we observed a significant negative correlation between WIN prediction response times and ATS predictions ($r(42) = -.36$, $p = .017$), such that games that elicited fast WIN predictions featured a greater proportion of favourite ATS predictions.

Table 2: Effect of independent variables for against the spread predictions.

Predictor Variable	*B*	*SE*	*p*
WIN prediction RT	−1.824	.431	< .001
Point spread magnitude	−0.031	.007	< .001

Note. The regression analysis used games as the unit of analysis. The dependent variable was the proportion of favourite ATS predictions for each game. The coefficient for response time without the covariate is −1.267 (SE = .508).

Next, we examined this relation further by regressing the proportion of favourite ATS predictions for each game on (a) point-spread magnitude and (b) WIN prediction response times (Table 2). Once again our hypothesis was supported, given that inclusion of point spread even increased the response-time coefficient.[4] Additionally, as shown in Table 3, WIN prediction response times remained a significant predictor of ATS predictions when including intuitive confidence as a predictor variable in our regression model, although the response time coefficient was substantially smaller than it was in Table 2, without confidence as a predictor.

[3]All response time measures were converted to $\log^{10}$ prior to analysis. Specifically, WIN prediction response times were calculated for each game by computing the mean value of $\log^{10}$ response times for each game.

[4]Analyses from a separate study assessing WIN and ATS predictions on the same set of 44 NBA games using a between-subjects design also found WIN prediction response time to be a significant predictor of ATS predictions, but only after controlling for point-spread magnitude, which evidently functions as a nuisance variable.

Table 3: Effect of independent variables for against the spread predictions.

Predictor Variable	*B*	*SE*	*p*
WIN prediction RT	−.946	.417	.029
Intuitive Confidence	.141	.033	< .001
Point Spread Magnitude	−.049	.007	< .001

Note. Data represents the output of a regression analysis conducted featuring games as the unit of analysis. The proportion of favourite ATS predictions for each game was used as the dependent variable and was predicted by WIN prediction response times, intuitive confidence, and point spread magnitude.

Lastly, it is possible that the observed relation between WIN prediction response times and ATS predictions was driven by idiosyncratic differences present between participants. To assess this possibility, we computed within-subjects regressions including across-subject averages in ATS predictions as a covariate, using a t-test to evaluate if the average effect of WIN prediction response times on ATS predictions was significantly different from zero. The results of this analysis revealed a non-significant result ($t(247) = -1.51$, $p = 0.13$, with a mean coefficient of $\beta = -.107$) implying that it is not subject-level differences driving the relation between WIN prediction response times and ATS predictions, but rather differences inherent across our sample of games.

4 Discussion

The current study investigated intuitive choice in a sports betting domain, with a primary focus on examining the relation between the speed of intuition generation and peoples' preferences for equally valid intuitive versus non-intuitive alternatives. Participants' WIN prediction response times were taken to represent the speed at which they were able to generate an intuitive response while favourite and underdog ATS predictions represented intuitive and non-intuitive choosing respectively. First, we predicted that intuition speed would be associated with intuitive confidence such that quickly generated intuitions would tend to be held with high confidence. In support of this prediction we observed a strong negative correlation between WIN prediction response times and WIN prediction confidence. Second, we predicted that intuition speed would relate to participant choice, such that games with faster WIN predictions would be more likely to have favourites chosen against the spread. We found support for this prediction as WIN prediction response times were found to be associated with ATS predictions in the hypothesized direction. Furthermore, the results of a regression analysis demonstrated that WIN prediction response times were a significant predictor of participants' choices in our point spread prediction task. This remained the case after statistically controlling for opposing information (i.e., point spread magnitude) and intuitive confidence suggesting that the speed of intuition generation plays a unique role in predicting participant choice in choice conflict situations featuring equally-valid intuitive and non-intuitive alternatives.

The present findings shed light on how people choose between intuitive and non-intuitive alternatives when faced with information opposing their intuitive choice. Previously, Simmons and Nelson (2006) demonstrated the importance of intuitive confidence and constraint information (i.e., information opposing the intuitive choice) in determining how people choose in similar choice conflict situations. While we successfully replicate these findings, our results suggest that the speed at which an intuition is generated also acts as a predictor of participant choice, with fast intuitions being more likely to be endorsed in the face of constraint information. One way intuition speed may influence participant choice is as a determiner of intuition confidence. Previous work by Thompson and colleagues (2011) demonstrated the relation between intuition speed and metacognitive feeling-of-rightness (FOR), with faster intuitions relating to stronger FORs and stronger FORs associated with less analytic engagement. Consistent with these findings, we observe a strong negative association between intuition speed (i.e., WIN prediction RT) and intuition confidence. However, the results of the current study also suggest that the speed with which an intuition is generated exerts an *independent* influence on participant choice, casting some doubt on an account in which intuition speed acts solely as a determiner of intuition confidence. Instead, we believe our results suggest a model in which the influence of intuition speed on choice is primarily felt through intuition speed's influence on intuitive confidence, just not entirely. Consistent with this interpretation, we find that inclusion of intuitive confidence as a predictor reduces the coefficient for intuition speed by about 48% (comparing Tables 2 and 3), leaving considerable variance for speed (although removal of error variance in confidence could reduce this coefficient still further).

In summary, we believe that intuition speed is predictive of choice primarily via its strong association with intuitive confidence, yet intuitive confidence does not appear to fully mediate the relation between intuition speed and choice, suggesting that the speed with which an intuitive response is generated may exert a unique influence on whether or not an intuitive alternative is chosen in the face of opposing information. Thus, we add to Simmons and Nelson's (2006) account of intuitive biases by highlighting the importance of intuition speed as a determiner of intuitive confidence and as a unique predictor of whether or not a person is likely to choose in line with their intuition in a choice conflict scenario.

In our preferred account, intuition speed, intuition confidence, and the strength of constraint information are all factors relevant to predicting whether or not a person is likely to choose in line with their intuition in a choice conflict scenario. Interestingly, Thompson and colleagues (2011) claim that intuition speed is a determiner of metacognitive FOR, but do not discuss intuition speed as an independent influencer of participant choice or level of analytic engagement. However, the results of the current study suggest that intuition speed may contribute to decision-making outside of simply being a determinant of FOR (or similarly intuitive confidence). That is, it is possible that intuition speed exerts an influence on participants' level of analytic engagement independent of its influence on metacognitive FORs, with fast intuitions leading to lower levels of analytic engagement. We speculate that intuition speed may play a more significant role (compared to intuitive confidence) in detecting conflict between intuitive and non-intuitive alternatives, whereas intuitive confidence may be more important for resolving this conflict once it is detected (Pennycook, Fugelsang & Koehler, 2015). This may be one way in which intuition speed may exert an influence on choice in choice conflict situations independent of intuition confidence. Nevertheless, the current study is not definitive in discriminating between the possible roles of intuition speed (e.g., as solely a determinant of intuitive confidence or as a determinant of intuitive confidence *and* an independent influencer of choice).

Replicating the results of past experiments (Paul & Weinbach, 2008; Simmons & Nelson, 2006; Simmons et al., 2011), participants in the current study were intuitively biased such that they elected to predict favourites significantly more than underdogs when making ATS predictions. Importantly, this bias towards predicting favourites in ATS predictions was related to intuition speed such that participants were more intuitively biased in their ATS predictions when the game was such that it elicited fast WIN predictions. According to Simmons and Nelson (2006), intuitive biases emerge as a result of people typically having a high degree of confidence in their intuitive choices. To this point, they were able to demonstrate that intuitive biases disappear when intuitive confidence is undermined. While this account is consistent with the results of the current study, so too is an explanation revolving around intuition speed. That is, alongside Simmons and Nelson's claim, we speculate that the ubiquity of intuitive biases may also emerge as a consequence of intuition generation frequently being a fast and fluent process. Therefore, we expect intuitive biases to be pervasive in situations that produce fast intuitions and to disappear in situations were no clear intuitive alternative springs to mind.

4.1 Limitations & future directions

The current study found evidence for intuition speed being a predictor of participant choice within a sports betting domain (specifically within the domain of point spread predictions). Thus, although we would like to make general claims about how people choose in the face of equally valid intuitive and non-intuitive alternatives, one clear limitation of the current study is that participants' choices were exclusively assessed in a sports betting domain. Therefore, future studies should investigate the relation between intuition speed, intuition confidence, and choice under conflict in different domains in order to ensure the generalizability of these results. Furthermore, the nature of the current study was correlational and thus does not allow us to speak of the causal effects of intuition speed on intuition confidence or participant choice. Studies in which the speed of intuition generation is directly manipulated should be undertaken to investigate the causal effects of intuition speed on intuition confidence and choice under conflict. Such an investigation would be meaningful as there are many factors that serve to disrupt the speed of intuition generation while simultaneously keeping the nature and strength of information for and against an intuitive alternative unchanged. Nevertheless, as we believe intuition speed to be a determinant of intuitive confidence, we expect that any manipulation that serves to influence the speed at which intuition generation occurs will also serve to influence peoples' confidence in their intuitions. Likewise, we predict that manipulating the speed of intuition generation will have a predictable influence on participant choice, both through intuition speed's influence on intuitive confidence and its unique influence on choice in choice conflict situations.

4.2 Conclusion

The current study expanded on previous findings by examining the relation between the speed at which participants arrive at an intuitive choice, the confidence they have in their intuitive choice, and the choices they make when choosing between equally valid intuitive and non-intuitive alternatives. We were able to provide evidence of an association between the speed at which an intuition comes to mind, intuitive confidence, and how conflict between an intuitive and non-intuitive choice is resolved. Specifically, the speed at which participants were able to generate an intuition (i.e., predict the winner of an NBA game) was shown to be a significant predictor of participants' confidence in their intuition, and their proclivity for endorsing the intuitive alternative in the face of opposing information. Overall, the data collected are consistent with the notion of intuition speed as a determinant of intuitive confidence and a significant factor in how people resolve conflict between intuitive and non-intuitive alternatives.

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