RUNNING HEAD: TOUCH, COOPERATION, AND PERFORMANCE

Tactile Communication, Cooperation, and Performance:

An Ethological Study of the NBA

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Abstract

Tactile communication, or physical touch, promotes cooperation between people, communicates distinct emotions, soothes in times of stress, and is used to make inferences of warmth and trust. Based on this conceptual analysis, we predicted that in group competition, physical touch would predict increases in both individual and group performance. In an ethological study, we coded the touch behavior of players from the National Basketball Association (NBA) during the 2008-2009 regular season. Consistent with hypotheses, early season touch predicted greater performance for individuals as well as teams later in the season. Additional analyses confirmed that touch predicted improved performance even after accounting for player status, preseason expectations, and early season performance. Moreover, coded cooperative behaviors between teammates explained the association between touch and team performance. Discussion focused on the contributions touch makes to cooperative groups and the potential implications for other group settings. (142 words)

Keywords: tactile communication, touch, team performance, cooperation, status

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Some non-human primates spend upwards of 20% of their waking hours grooming, a behavior primates rely upon to reconcile following conflict, to reward cooperative acts of food sharing, to maintain close proximity with caretakers, and to soothe (de Waal, 1989; Harlow, 1958). In humans, touch may be even more vital to trust, cooperation, and group functioning. Touch is the most highly developed sense at birth, and preceded language in hominid evolution (Burgoon, Buller, & Woodall, 1996). With brief, one second touches to the forearm, strangers can communicate pro-social emotions essential to cooperation within groups—gratitude, sympathy, and love—at rates of accuracy seven times as high as chance (Hertenstein, Keltner, App, Bulleit, & Jaskolka, 2006). Touch also promotes trust, a central component of long-term cooperative bonds (Craig, Chen, Bandy, & Reiman, 2000; Sung et al., 2007; Williams & Bargh, 2008).

Guided by recent analyses of the social functions of touch (Hertenstein, 2002), we tested two hypotheses: First, we expected touch early in the season to predict both individual and team performance later on in the season. Second, we expected that touch would predict improved team performance through enhancing cooperative behaviors between teammates.

Touch, Pro-Social Intent, and Cooperation

One of the major functions of touch is its promotion of trust and cooperation. Trust is a fundamental element of interpersonal relationships (Axelrod, & Hamilton, 1981; Deutsch, 1958; Kosfeld, Heinrichs, Zak, Fischbacher, & Fehr, 2005), and touch is a powerful enabler of trust between group members. For example, the insular cortex, a brain region active during physical touch (Craig, Chen, Bandy, & Reiman, 2000; Sung et al., 2007) is also activated during many

positive and negative affective experiences, including most notably, experiences of trust (King-Casas et al., 2008; Sanfey, Rilling, Aronson, Nystrom, & Cohen, 2003). In addition, touch is also linked to inferences of warmth and cooperation. For example, tactile sensations of warmth, caused by a hot coffee cup, led to inferences of increased warmth and trust of new targets (Williams & Bargh, 2008). Finally, touch between players has been found to increase cooperation and mutual trust in economic games (Kurzban, 2001).

Touch, especially from close others, also reduces feelings of threat. For example, women showed decreased threat-related brain activation during a shock paradigm when holding the hand of a spouse, but not when they held a stranger's hand (Coan, Schaefer, & Davidson, 2006). As another example, children who received soothing tactile contact showed an attenuated cardiovascular response to a heel lance procedure (Gray, Miller, Phillip, & Blass, 2002).

In light of how touch soothes and promotes inferences of cooperation and trust, we reason that touch increases cooperative behaviors within groups, which in turn enables better group performance. The right kind of touch bolsters inferences that group members are cooperating for the good of the group, and are not for example, intending to engage in selfish actions. Thus, touch should predict greater interdependent and cooperative actions among teammates that are essential to group functioning (see Watson & Ecken, 2003; Wieselquist, Rusbult, Foster, & Agnew, 1999). With respect to the context of the current study—performance of NBA teams—we predicted that increased touch between teammates would predict greater performance, and that the association between touch and performance would be mediated by the extent that teammates engaged in cooperative behaviors.

In the present research, we tested this formulation in a longitudinal, ethologically oriented study of touch and team performance in the NBA. More specifically, we examined whether the

touch observed during one game early in the season would predict enhanced team cooperation and individual and team performance over the course of the entire season. To more precisely document the relation between touch, cooperation, and group performance, we controlled for player status, pre-season expectations, and early-season performance.

Method

Procedure

Coding of the tactile communication of 294 players from all 30 National Basketball Association (NBA) teams yielded the data to test our hypotheses. Each team's tactile behavior was coded during one game played within the first two months of the start of the 2008-2009 NBA regular season. Games were coded for physical touch and cooperation by two separate teams of coders.

Physical Touch Coding Procedure

Two coders judged the occurrence and duration of physical touch for each of the 30 NBA teams (Ellyson & Dovidio, 1985). The coders overlapped on all games and teams. Coders recorded the duration of each touch in seconds, the player(s) involved in the touch, the player who initiated the touch, and the type of touch. Coding focused on intentional forms of touch; thus, contact resulting directly from playing basketball (e.g., fighting for position, setting screens) was not coded. In addition, due to unreliable camera angles we chose not to code touch during slow-motion playbacks, reaction shots, timeouts, or during the end of game quarters.

We focused our analysis on twelve distinct types of touch that occurred when two or more players were in the midst of celebrating a positive play that helped their team (e.g., making a shot). These celebratory touches included fist bumps, high fives, chest bumps, leaping shoulder bumps, chest punches, head slaps, head grabs, low fives, high tens, full hugs, half hugs, and team

huddles. On average, a player touched other teammates ($M = 1.80$, $SD = 2.05$) for a little less than two seconds during the game, or about one tenth of a second for every minute played.

Our touch coding procedure was consistent and reliable. Each touch was considered an agreement if both coders rated the touch as occurring at the same time during the game. Coders agreed on 83.1% of all touches. We also examined correlations between the touch duration of each coder. Coders touch duration codes, summed by team, were highly significantly correlated, $r(28) = .85$, $p < .01$, and reliable ($\alpha = .90$).

Cooperation Coding Procedure

Using established coding procedures (e.g., Ellyson & Dovidio, 1985), six coders coded the amount of cooperation exhibited by each of the 30 NBA teams using the same games as those used for touch codes. All coders were blind to the hypotheses of the study and were knowledgeable about basketball. Initially the coders along with the first two authors met to discuss behaviors that show team cooperation and trust. We reasoned that cooperation in the context of group competition would manifest in increased reliance on one's teammates, even when reliance on these teammates came at the expense of individual performance. This conceptualization of cooperation and trust is consistent with other research (e.g., Wieselquist et al., 1999).

Based on this reasoning, the following behaviors were considered expressions of cooperation and trust: talking to teammates during games, pointing or gesturing to one's teammates, passing the basketball to a teammate who is less closely defended by the opposing team, helping other teammates on defense, helping other teammates escape defensive pressure (e.g., setting screens), and any other behaviors displaying a reliance on one's teammates at the expense of one's individual performance. In contrast, the following behaviors were considered

expressions of a lack of cooperation and trust: taking shots when one is closely defended by the opposing team, holding the basketball without passing to teammates, shooting the basketball excessively, and any other behavior displaying reliance primarily on one's self rather than on one's teammates.

To code cooperation, coders watched each quarter of a game while focusing on the cooperative behavior of the team according to the game-specific definitions of cooperative behavior defined above. Coders watched each quarter twice, and after each quarter, rated cooperation using a 4-point scale (0 = *no cooperation at all*, 3 = *a great deal of cooperation*). Teams that showed numerous behaviors associated with cooperation and none associated with lack of cooperation were coded as "3" whereas teams that showed no cooperative behaviors and many uncooperative behaviors were coded as "0." Coder assessments of cooperation were highly consistent with each other (α = .83). Based on these codes, mean cooperation was computed for each team by averaging the codes over the entire game (M = 1.92, SD = 0.31).

To validate our cooperative behaviors, a separate set of 22 raters determined how much the behaviors coded as acts of cooperation indicated cooperation and trust in comparison to typical basketball behaviors (e.g., scoring points, rebounding, committing a foul). Raters used 7-point likert scales (1 = *not at all*, 7 = *a great deal*). As expected, our cooperative behaviors were associated with more trust and cooperation (M = 5.67) in comparison to these typical basketball behaviors (M = 3.26), $F(1,21)$ = 121.17, p < .01.

Performance

Performance in basketball can be assessed using a number of indicators. While scoring points has typically been considered one of the best ways to measure performance, recently sports statisticians in collaboration with coaches and basketball executives have identified two of

the main determinants of team success: gaining possession of the basketball and efficiently scoring points with the basketball once one has gained possession (Berri, Schmidt, & Brook, 2007). For example, while some players may score a lot of points, they may do so by missing a high volume of shots, or in the process of scoring, players may turn the basketball over. Each of these behaviors relinquishes possession of the basketball to the opposing team. In contrast, some players score fewer points, but take fewer shots, and win possession of the basketball through rebounding missed shots or by stealing the basketball from opposing players. Players who engage in these behaviors during basketball games actually impact their team's outcomes more positively, because these players gain and use possessions more efficiently (Berri et al., 2007). Our measures of team and individual performance were designed to capture this efficiency-based measure of performance.

Player performance. To assess player performance we used the Win Score, a performance measure that accounts for the positive impact a player has on his team's success (rebounds, points, assists, blocks, steals) while also accounting for the amount of the team's possessions that player uses (turnovers, shot attempts) (Berri et al., 2007). Win Score is a practical measure of performance because it can be calculated using statistics readily available on NBA websites. Conceptually, Win Score is a valid measure of performance because it measures efficiency in terms of gaining and using possessions, a necessary part of scoring points and winning games. Win Score at the team level was significantly positively correlated with team wins during the 2008-2009 season, $r(28) = .66$, $p < .001$. Win Score was computed for each player based on their season statistical totals ($M = 4.80$, $SD = 3.21$).

Team performance. We assessed team performance using several statistical indicators from NBA websites accounting for different facets of team performance. Offensive and

defensive efficiency were the amount of points a team scores or allows every 100 possessions (NBA.com, n.d.). Assist ratio, an assessment of a team's passing ability, was the percentage of a team's possessions that result in an assist (ESPN.com, n.d.). Rebound ratio, a team's rebounding ability, was the percentage of missed shots a team rebounds (NBA.com, n.d.). We also assessed team performance using two measures of overall performance: team Win Score (Berri et al., 2007) and NBA efficiency, a similar measure of team performance that penalizes teams for using possessions negatively (NBA.com, n.d.).

All measures of performance were significantly correlated with the number of season wins for each team $r(28) = .48$ to $.79$, $p < .01$. To compute our overall measure of performance, we standardized each measure of team performance described above, then computed an average between all measures ($\alpha = .83$). This final measure of performance was also significantly associated with season wins $r(28) = .84$, $p < .001$.

Salary

Previous research suggests that higher socioeconomic status is associated with increased rates of touch (Henley, 1973). Based on this research, we controlled for socioeconomic status using player salaries ($M = \$5,370,271.66$, $SD = \$5,090,681.26$) for the 2008-2009 NBA regular season. Salaries were recorded from NBA websites (ESPN.com, n.d.; NBA.com, n.d.).

Preseason Expectations

Because associations between early season touch and season team performance could potentially be driven by positive expectations or optimism surrounding teams, we controlled for preseason expectations for the 2008-2009 NBA season in our analysis. To measure preseason expectations, we used two measures: (1) predictions of season success by NBA general managers (NBA.com, 2008), and (2) predictions of season success made by NBA television analysts

(NBA.com, 2008). For NBA executive and television analyst preseason expectations, if any executive or analyst predicted a team would win one of the six NBA divisions, one of the two NBA conferences, or the NBA championship, the team was coded as a "1," and all other teams were coded as "-1."

<div align="center">Results</div>

Our first hypothesis predicted that increased touch observed at the start of the season would predict enhanced individual and team performance throughout the entire season. To test this hypothesis, we first examined the relationship between touch and performance while accounting for player status, preseason expectations, and early season performance.

Touch and Individual Performance Independent of Player Status

We first assessed the relationship between individual touch and performance while accounting for player salary, because wealthier and more powerful individuals tend to touch more (Henley, 1973). We conducted a hierarchical regression predicting individual performance with player status in step 1, and touch in step 2. Indeed, better compensated players engaged in higher rates of touch, consistent with the aforementioned literature on status and touch $\beta = .50$, $t(280) = 9.55$, $p < .01$. Above and beyond this association between salary and touch, touch predicted increased player performance as hypothesized $\beta = .17$, $t(280) = 3.18$, $p < .01$. Overall, early season touch predicts season performance independent of player salary.

Touch and Team Performance Independent of Preseason Expectations

It is also possible that the association between early season touch and overall season performance is due to expectations about the team's likely success before the start of the season. To assess this alternative hypothesis, we computed a hierarchical regression analysis predicting team performance with preseason expectations of NBA executives entered in step 1, and team

touch entered in step 2. Consistent with our hypotheses, touch continued to predict team performance $\beta = .33$, $t(27) = 2.26$, $p < .05$, even after accounting for the preseason expectations of NBA executives $\beta = .54$, $t(27) = 3.72$, $p < .01$. Using a parallel hierarchical regression analysis, touch also continued to predict team performance $\beta = .34$, $p < .05$ after accounting for preseason expectations of television analysts $\beta = .50$, $p < .01$.

Touch and Performance Independent of Early Season Performance

It is also possible that early season touch merely covaries with performance during the game in which touch was coded, and that the association between touch and performance over the entire season is simply a byproduct of this single game association. For individual player performance, we addressed this alternative in a hierarchical regression analysis predicting individual player performance over the entire season with each player's minutes played and performance (Win Score) during the single game coded for touch in step 1, and individual player touch in step 2. Not surprisingly, players that performed better $\beta = .33$, $t(263) = 5.73$, $p < .01$ and played longer $\beta = .31$, $t(263) = 5.20$, $p < .01$ during the early season game performed better over the course of the entire season. Despite these associations and consistent with our hypothesis, touch at the beginning of the season continued to predict performance over the course of the entire season $\beta = .11$, $t(263) = 2.10$, $p < .05$. Touch predicts individual performance over the entire even after accounting for early season performance.

At the team level, within a regression framework we predicted team performance over the entire season with margin of victory during the game coded for touch in step 1, and early season team touch in step 2. As expected, after accounting for team margin of victory $\beta = -.08$, $t(27) = -0.45$, *ns*, more early season touch predicted greater team performance over the entire season $\beta = .42$, $t(27) = 2.31$, $p < .05$.

Finally, we expected that touch would continue to predict team performance even after accounting for status, preseason expectations, and early season performance. To that end, we computed a hierarchical regression with total team salary (NBA.com, n.d.), NBA executive expectations, and single game point differential in step 1, and team touch in step 2. Consistent with our hypothesis, touch continued to predict team performance $\beta = .34$, $t(25) = 2.55$, $p < .05$ even after controlling for these variables. Team salary $\beta = .33$, $t(25) = 2.36$, $p < .05$ and NBA executive expectations $\beta = .45$, $t(25) = 3.14$, $p < .01$ also continued to predict team performance in this analysis.

Cooperation Explains the Relationship Between Touch and Enhanced Performance

The central concern of our investigation was to determine if touch predicts increased performance by promoting cooperation between teammates. In this mediation analysis (Baron & Kenny, 1986), we expected cooperation between teammates to fully explain the relationship between touch and team performance over the entire season. In the top half of Figure 1, we have displayed the previous analysis, controlling for team margin of victory, with team touch predicting team performance over the entire season. The bottom half of Figure 1 shows that when accounting for the significant relationship between cooperation between teammates and touch $t(27) = 2.78$, $p < .05$, and the association between cooperation and performance over the entire season $t(26) = 2.90$, $p < .01$, touch no longer predicts performance over the entire season (*Sobel z* = 2.01, $p < .05$). Overall, this pattern of results shows that touch indicates cooperation between teammates, which in turn, predicts performance over the entire season.

Another way to show that touch predicts increased performance, and this relationship is accounted for by cooperative behavior, is to examine performance outcomes in games immediately following the game in which touch was coded. To that end, we examined touch for

teams with winning records versus losing records in the subsequent five games immediately after the game coded for touch. As shown in Figure 2, teams that went on to enjoy winning records directly following the coded game engaged in more touch ($M = 23.79$) than teams with losing records after the coded game ($M = 16.14$), $F(1,28) = 5.46$, $p < .05$, $\eta^2 = .16$. In addition, when accounting for cooperation between teammates in this analysis, the observed difference in touch between teams with losing and winning records was attenuated $F(1,27) = 1.77$, $p = .20$.

Discussion

In this ethological study of physical touch during NBA games we have demonstrated that touch is crucial for predicting performance in competitive group settings. Consistent with expectation, touch was associated with sophisticated metrics of higher performance at the individual and group level, and this touch to performance relationship held when accounting for player status, preseason expectations, and early season performance during the game in which touch was assessed. Also in line with our theorizing about the cooperative functions of touch, mediational analyses showed that touch predicts performance through fostering cooperation between teammates.

It is important to bear in mind that this study assessed patterns of physical touch in a specific competitive group—NBA teams. Basketball has evolved its own language of touch (fist bumps, leaping shoulder bumps) that quite obviously; will not generalize to other group settings, for example in work organizations or schools. Further studies of touch and group cohesion will need to take a similar ethological approach and focus on context specific forms of touch.

In a similar vein, the ethological approach of the current investigation leaves open the possibility of other alternative interpretations of our results, not accounted for in the present analyses. For instance, it is possible that leadership style or personality—of chief executives,

head coaches, or key players—may have accounted for the association between touch and team performance observed in the present study. Future experimental work on this possibility is warranted. So too are experimental approaches examining the relationship between increased touch and individual and team performance, which, we reason, would show that the occurrence of touch in team settings enhances performance of many kinds.

Touch is central to many realms of social life, from parent-child attachments to cooperation amongst non-kin. The present research adds to this literature (for review, see Hertenstein, 2002), suggesting that touch may promote group functioning during competition by enhancing cooperation and performance. This latter result suggests future areas of research. For example, as trust and cooperation are associated with better student performance in classrooms (Watsen & Ecken, 2003), and greater commitment in close relationships (Simpson, 1990; Wieselquist et al., 1999), perhaps touch interventions can be used to promote relationships between students and teachers, or to strengthen bonds between romantic partners. In addition, that touch was associated with elevated status is also noteworthy, and suggests future research directions regarding how certain forms of touch may help individuals ascend status hierarchies within team settings.

In addition to soothing and communicating emotions, the present research provides some of the first empirical evidence showing that touch enhances group performance through building cooperation. High fives and fist bumps, seemingly small dramatic demonstrations during group interactions, have a lot to say about the cooperative workings of a team, and whether that team wins or loses.

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Figure Captions

Figure 1. The effect of early season touch on season performance explained by team cooperation and controlling for game margin of victory. Standardized beta weights are shown. * $p < .05$, ** $p < .01$

Figure 2. Duration of touch as a function of teams with winning versus losing records immediately following the game coded for touch.

| Early Season Touch | → .42* → | Season Performance |

Cooperation

.44*   .56**

| Early Season Touch | → .17 → | Season Performance |
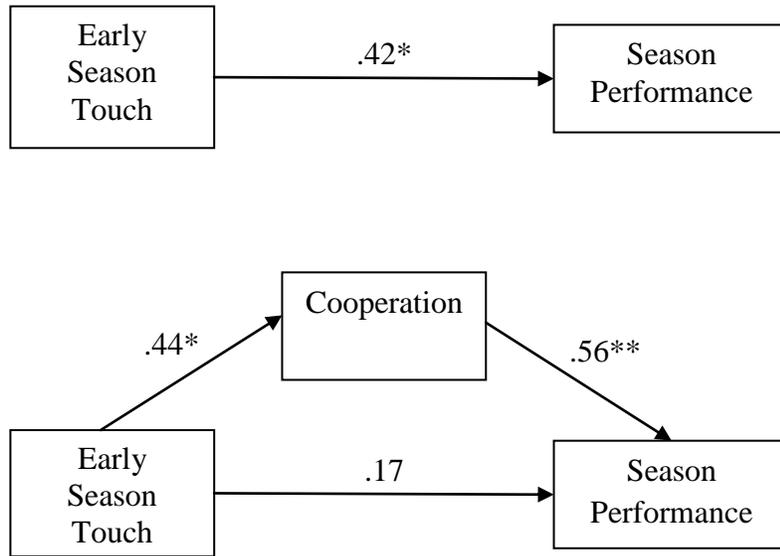
Touch for Teams with Winning and Losing
Records