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Motivation gain in Major League Baseball: Köhler effect vs. social compensation

MYOUNGJIN SHIN*, YUNSIK SHIM

** Department of Leisure Sports, 346, Joongang-ro, Samcheok-si, Kangwon National University, Gangwon-do, South Korea*
***Soonshunhyang University, Asan-so, South Corea - shinmj80@kangwon.ac.kr*

The Köhler effect and social compensation are two theories that explain the phenomenon of motivation gain. Both theories explain positive effects of a group, unlike social loafing; however, the causes of motivation gain are different between the two theories. The Kohler effect is the case wherein motivation gain appears in the low performer under the condition that the discrepancy between one's ability and coworker's ability were moderate. In contrast, social compensation was induced motivation gain in the high performer. Thus, this study identifies the appropriate theory for real-world sports by finding the phenomenon of motivation gain using HLM analysis. To test the Köhler motivation gain effect and social compensation effect, the study uses 12-season major league baseball statistical data (2003-2015) of 7,056 players, which includes 3,288 pitchers and 3,768 batters. The motivation gain for batters and pitchers shows social compensation, rather than the Köhler effect. Thus, a high-performing player improves by experiences from motivation gain when he/she chooses a team with high annual salary deviation if differences in skill are significant.

KEY WORDS: Köhler effect, Motivation gain, Social compensation theory, major league baseball.

Introduction

Do group characteristics positively or negatively influence personal performance? Researchers explain the former with motivation gain and the latter with motivation loss. Social loafing is a representative phenomenon of motivation loss, which signifies the possibility of reducing an individual's effort when individuals form a group (Baron & Kerr, 2003; Karau &

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Correspondence to: Yungsik Shim,Soonchunhyang University 646, Eupnae-ri, Shinchang-myeon, Asan-si, South Korea (e-mail: yunsikshim@gmail.com)

Williams, 1993). In contrast, two theories explaining the phenomenon of motivation gain are the Köhler effect and social compensation.

Köhler (1926, 1927) conducted a study on 72 male members of a rowing club, lifting weights 75 cm off the ground every two seconds. For this task, 41 kg and 82 kg weights were used for the individual and two-person-team conditions, respectively. The salient feature of this task was that the two-person-team condition was determined entirely by the low performer because if the low performer was unable to lift the weight, the relatively high performer could lift the 82 kg weight 75 cm. Steiner (1972) classified this type of task as conjunctive. Many follow-up studies on the Köhler motivation gain were conducted with consistent results in conjunctive tasks (Gockel, Kerr, Seok, & Harris, 2008; Hertel, Kerr, & Messé, 2000; Kerr, Messé, Park, & Sambolec, 2005; Kerr et al., 2007; Kerr & Seok, 2011; Kerr, Seok, Poulsen, Harris, & Messé, 2008; Lount, Kerr, Messé, Seok, & Park, 2008; Messé, Hertel, Kerr, Lount, & Park, 2002). Most studies that investigated the Köhler effect in general areas were conducted with specific tasks in laboratories (Hertel, Niemeyer, & Clauss, 2008; Kerr et al., 2005; Kerr et al., 2007; Lount et al., 2008; Weber & Hertel, 2007).

Osborn, Irwin, Skogsberg, and Feltz (2012) investigated the Köhler effect in real sports groups and examined if it exists on real sports fields using records of point-accumulation tasks, such as swimming relays, and found the Köhler motivation gain effect in which the low performer improved his/her records in relays relative to their competition. Hüffmeier and Hertel's (2011) analysis of swimming relay archival data shows the possibility of other motivation gain effects (i.e., social compensation), rather than the Köhler effect. They analyzed archival data of the Olympic swimming relay, and found that the third and fourth swimmers showed a record improvement compared to their individual record. Considering the fastest swimmers in relay competition are the third or fourth swimmers, this result can be regarded as an improvement in performance of the higher performers. Although research methods and sports event are the same, the results are inconsistent.

Social compensation is the case in which people make more effort under a collective setting rather than under the co-active setting. One of the factors that causes social compensation is insufficient performance of other members (Karau & Williams, 1997; Williams & Karau, 1991). In such a situation, an individual will exert more effort to accomplish the collective goal because the contribution of his/her group member is insufficient. An important condition to induce from social compensation is that the collective goal should be perceived as valuable. According to the expectancy value theory of effort (Heckhausen, 1977; Vroom, 1964), an individual's effort varies depending on

value of the task, and while an individual will excel if the task is valuable, he/she will not excel if the task is not valuable. If this is applied to social compensation and social loafing, a specific individual will exert much effort when his/her colleagues' performance is expected to be low if a valuable task is determined by dependency of members (social compensation), the individual will exert less effort when colleagues' performance is expected to be good (social loafing).

Major causes of the Köhler effect and social compensation are discrepancies in the ability of group members and the perception of the value of the collective goal rather than the number of group members. The Köhler effect is based on indispensability of effort and the goal-setting version of social comparison (Messé et al., 2002). Indispensability of effort means that when the discrepancy between one's ability and one's coworker's ability are moderate, a low performer believes that his or her additional effort is valuable to the team's success, thereby achieving maximum motivation gain. The goal-setting version of social comparison assumes that less-capable group members use the performance level of superior group members as criterion for goal comparisons. Thus, the less-capable group members can achieve maximum motivation gain by recognizing them as achievable goals when discrepancy between less-capable and superior group members' ability is moderate. According to Williams and Karau (1991), social compensation is induced under two-conditions: the expectation that other group members will perform insufficiently, and the group product is integral to the individual. There is a possibility of the Köhler effect and a social compensation may have occurred in MLB because individuals can clearly recognize discrepancy in the team member's ability and have important collective goals such as to win games or win the World Series.

While many studies have been conducted on social loafing in sports (Everett, Smith, & Williams, 1992; Hardy, & Crace, 1991; Hertel, Deter, & Konadt, 2003; Williams, Nida, Baca, & Latané, 1989), studies on social compensation are lacking. Especially, even though social compensation and the Köhler effect are theories that explain positive effects of a group, the group effect differs depending on its high and low performers. While social compensation occurs when superior group members increase individual efforts of less-capable group members in a highly valued task (Williams & Karau, 1991), the Köhler effect signifies that a moderate performance discrepancy between group members produces the largest motivation gain (Messé et al., 2002). Because the expected outcome according to an individual's performance within a team is conflicting between two theories, which explains the phenomenon of motivation gain, it is unclear if the motivation gain appear-

ing in real sports areas is centered on superior or less-capable group members. Thus, it is necessary to determine if the phenomenon of motivation gain is a performance improvement of superior group members, according to the theory of social compensation, or that of less-capable group members, according to the Köhler effect.

Previous studies have been verified that the Köhler effect and social compensation have not been studied using multilevel analysis. A multilevel model is an analysis method that examines influence of a team-level (Level 2) variable on an individual-level (Level 1) variable. It is useful for explaining the phenomenon of motivation gain because it allows for examination of influence of group characteristics on individuals (Kenny, Mannetti, Pierro, Livi, & Kashy, 2002; Myers & Feltz, 2007). Thus, this study uses hierarchical linear modeling (HLM) to test the phenomenon of motivation gain through influence of group characteristics on individual performance. The HLM analysis is possible on MLB data because players' salaries and records have been accumulating for decades. Among this data, the annual salaries of batters and pitchers are objective indices, which comprehensively evaluate individual performance, and allow for prediction of the relationship with other performance-related indices (e.g., Batting Average-AVG, Win Above Replacement-WAR, Walks Plus Hits Per Inning Pitched-WHIP, and Earned Run Average-ERA).

Osborn et al. (2012) compared individual performance under different conditions to verify motivation gain: performing alone or performing as part of a team. In contrast, this study examined the Köhler effect and social compensation by comparing the different condition: individuals belong to a team with large performance deviation or individuals belong to a team with small performance deviation. A positive correlation between individual salary and records shown in MLB data (Holmes, 2011) confirms general expectation that players earning a higher salary perform better. Thus, if high performers (or high-paid players) playing on a team with large performance deviation (or large deviation of annual salary)[1] strengthen the relation between individual records such as AVG, WAR, WHIP and ERA and annual salary, rather than a team with small performance deviation[2], it can be concluded that social compensation exists. However, if low performers[3] (or low-paid player) play-

[1] It means that other team players were relatively less level of performance than the high performers.

[2] Means that other team players had level of performance similar to low performers It means that other team players had level of performance similar to the high performers.

[3] Since MLB is the league with the best players in the world, there will not be much difference in performance between players. Thus, low-performers mentioned in this article means that the discrepancy between the high performer and low performer's ability is moderate.

ing on a team with large deviation of annual salary[4] strengthen the relation between individual record and annual salary, rather than a team with small deviation of annual salary[5], it can be concluded that the Köhler effect would occur.

Additionally, previous research related to the Köhler effect and social compensation examined the phenomenon of motivation gain through experimental projects, instead of the sports field. Thus, this study will investigate if the phenomenon of motivation gain is due to social compensation or the Köhler effect, by applying HLM analysis based on Major League Baseball (MLB) statistical data. Accordingly, we propose the following hypotheses.

Hypothesis 1: AVG or WAR will be positively related to a batter's annual salary (Level 1), and ERA or WHIP will be negatively related to a pitcher's annual salary (Level 1).

Hypothesis 2: Positive influence of AVG or WAR on the annual salary of the top-performing batter will be less than that of the annual salary of the low-performing batter, and such an influence will appear in the team that has large deviation in annual salary (Level 2).

Hypothesis 3: Negative influence of ERA or WHIP on the annual salary of the top-performing pitcher will be less than that on the annual salary of the low-performing pitcher, and such an influence will appear in the team that has large deviation in annual salary (*Level 2).*

Hypothesis 4: Positive influence of AVG or WAR on the annual salary of the top-performing batter will be greater than that of the annual salary of the low-performing batters, and such a relationship will appear in the team that has large deviation in annual salary *(Level 2).*

Hypothesis 5: Negative influence of ERA or WHIP on the annual salary of the top-performing pitcher will be greater than that of the annual salaries of the low-performing pitchers, and such a relationship will appear in the team that has large deviation in annual salary (Level 2).

After testing the group effect that changes the relevancy of *AVG*, *WAR*, *ERA*, and *WHIP* in predicting annual salaries according to magnitude of deviation, through Hypotheses 1, an examination was conducted to determine if the group effect was the Köhler effect, through Hypotheses 2 and 3, and verification was conducted to determine if the group effect was caused by social compensation, through Hypotheses 4 and 5.

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[4] It means that other team players were at relatively higher level of performance than low performers.

[5] It.

Research Method

Data collection

To test the Köhler motivation gain effect and social compensation effect, 13-year MLB statistical data (2003-2015) was used. Data published by USA Today. (http://www.usatoday.com/sports/mlb/salaries/) was used for individual player's annual salaries, and data published by ESPN (http://espn.go.com/mlb/statistics) was used for individual records. The data used for final analysis were identified using two modification steps. In step 1, player data that do not exist in annual salary and individual records data were deleted. In case of a player who moved to a different team, only the record of the team presented in the annual salary data of USA Today was used in analysis. In step 2, the athlete's current season salary ($salary_{CS}$ represents the current season salary variable in this study) was influenced by statistics from his previous season individual record, such as *AVG, OPS, WHIP, ERA* (these variables for the previous season individual record are identified as AVG_{PS}, OPS_{PS}, $WHIP_{PS,}$ and ERA_{PS} in this study), so data which not available for the previous season individual record based on $salary_{CS}$ were also deleted. Data on 7,056 players, which include 3,288 pitchers and 3,768 batters, are used for analysis, as presented in Table I.

Analysis method and procedure

This study investigates the phenomenon of motivation gain (the Köhler effect and social compensation) using HLM analysis. To effectively analyze the phenomenon, we divided modified data set 1 (4,815 hitters, 4,426 pitchers) in Level 1 into two groups based on average salary: low performers are those with salaries below average, and high performers are those with above average salaries (Table I). Data set in Level 2 represents the slopes (M_{Slope}) and intercepts ($M_{intercept}$)[6] of average salaries, and slopes (SD_{Slope}) and intercepts ($SD_{intercept}$)[7] of the standard deviation of salaries in each MLB team for 12 years. This suggests that teams with high average salaries consist of high performers, while teams with large deviations in athletes' incomes have wide gaps in performance among players.

Thus, statistics in Level 2, which represent deviations of team salaries, such as ITD, TD, are appropriate for examining the Köhler effect or the group effect based on social compensation. For example, if γ_{31} or γ_{32} of Level 2 data in the conditional model (Table 2) are statistically significant, the impact of performance indices such as $WHIP_{PS}$, ERA_{PS}, AVG_{PS}, and WAR_{PS} on an individual's $salary_{CS}$ is differentiated by performance level of the previous season (high vs. low). Thus, this implies that the impact of individual level is affected by team variables (Level 2), including ITP, TP, ITD, and TD. We also conclude that if γ_{31} or γ_{32} are statis-

[6] Mslope and Mintercept represent slopes and intercepts in the regression formula of 12 years (x-axis) on means of team salary (y-axis) 2003-2014. In this study, Mslope and Mintercept is indicated as ITP (Increment of Teammate Performance) and TP (Teammate Performance).

[7] SDslope and SDintercept represent slopes and intercepts in the regression formula of 12 years (x-axis) on the standard deviation of team salary (y-axis) 2003-2014. In this study, SDslope and SDintercept is indicated as ITD (Increment of Teammate Discrepancies) and TD (Teammate Discrepancies).

Table I
Descriptive Data

Season		Batters			Pitchers		
Current	Previous	RD (*n*)	MS1 (*n*)	MS2 (*n*)	RD (*n*)	MS1 (*n*)	MS2 (*n*)
04	03	435	410	327	394	353	254
05	04	431	399	318	398	360	271
06	05	423	399	318	400	371	283
07	06	430	407	317	416	372	283
08	07	427	407	315	427	388	293
09	08	410	395	311	409	388	284
10	09	419	405	328	411	374	272
11	10	429	412	320	411	374	280
12	11	435	415	314	412	384	295
13	12	394	380	309	422	388	263
14	13	417	401	293	414	340	237
15	14	409	385	298	433	334	273
Total		*5,059*	*4,815*	*3,768*	*4,947*	*4,426*	*3,288*

[Note] RD = row data; MS = modification step

tically significant in ITD or TD and not significant in ITP or TP, the larger the gap in performance level between high performers and low performers at the team level, the greater the predictive power of individual's performance indices on their salary.

In conclusion, if predictive power of individual's performance indices is higher when high performers select teams with larger deviation in team salaries than when they select teams with smaller difference in team salaries, social compensation is supported. Conversely, if predictive power of those indices is higher when low performers choose teams with larger gaps in team salaries than when they choose teams with smaller gaps in team salaries, the Köhler effect is supported.

Independent variables $WHIP_{PS}$, ERA_{PS}, AVG_{PS}, and WAR_{PS} used in HLM analysis to predict annual $salaries_{CS}$ were used after centering, which signifies that the means of $WHIP_{PS}$, ERA_{PS}, AVG_{PS}, and WAR_{PS} of the affiliated MLB team is subtracted from an individual's $WHIP_{PS}$, ERA_{PS}, AVG_{PS}, and WAR_{PS}, which are independent variables. The reason for centering the independent variables is to make interpretation of results more meaningful. Too, HLM analysis is conducted in two models, the random coefficient model and the conditional model, using Equations in Table II If statistical significance of γ_{31} or γ_{32} was found, the result was interpreted using a three-way interaction graph. The HLM 7.0 program was used for analysis, and significance level was set at .05

Results

Testing group effect in batters

Mean annual $salary_{CS}$ of 3,768 batters analyzed from data was $4.54 million USD. The slope of mean annual $salary_{CS}$ of 30 MLB teams for 12 years was .13, and the slope of standard deviations was .14, which has been steadily

Table II
Analysis Models

Model	Level	Equations
Random-Coefficient Model	Level 1	$(Salary_{CS})_{ij} = \beta_{0j} + \beta_{1j}(Skill\ Index_{PS})_{ij} + \beta_{2j}(PL_{PS})_{ij} + \beta_{3j}(Skill\ Index_{PS} \times PL_{PS})_{ij} + r_{ij}$
	Level 2	$\beta_{0j} = \gamma_{00} + u_{0j}$, $\beta_{1j} = \gamma_{10} + u$, $\beta_{2j} = \gamma_{20} + u_{2j}$, $\beta_{3j} = \gamma_{30} + u_{3j}$
Conditional Model	Level 1	$(Salary_{CS})_{ij} = \beta_{0j} + \beta_{1j}(Skill\ Index_{PS})_{ij} + \beta_{2j}(PL_{PS})_{ij} + \beta_{3j}(Skill\ Index_{PS} \times PL_{PS})_{ij} + r_{ij}$
	Level 2	$\beta_{0j} = \gamma_{00} + \gamma_{01}(\text{ITP } or \text{ ITD})_j + \gamma_{02}(\text{TP } or \text{ TD})_j + u_{0j}$ $\beta_{1j} = \gamma_{10} + \gamma_{11}(\text{ITP } or \text{ ITD})_j + \gamma_{12}(\text{TP } or \text{ TD})_j + u_{1j}$ $\beta_{2j} + u_{1j\ 2j} = \gamma_{20} + \gamma_{21}(\text{ITP } or \text{ ITD})_j + \gamma_{22}(\text{TP } or \text{ TD})_j + u_{2j}$ $\beta_{3j} + u_{2j\ 3j} = \gamma_{30} + \gamma_{31}(\text{ITP}_e \text{ or ITD})_j + \gamma_{32}(\text{TP } or \text{ TD})_j + u_{3j}$

[Note] CS = current season; PS = previous season; Skill Index are *WHIP*, *ERA*, *AVG*, or *WAR*; PL = performance level; ITP = increment of teammate performance; TP = teammate performance; ITD = increment of teammate discrepancies; TD = teammate discrepancies

increasing for 12 years. Intercept of the mean CS annual salary of the 30 MLB teams for 12 years was 2.68, and intercept of standard deviations was 3.25.

To test Hypotheses 1, a random coefficient model analysis was conducted to examine if the slope, in which AVG_{PS} and WAR_{PS} predict annual $salary_{CS}$, influences the group level. Mean of β_{0j} (γ_{00}) of independent variables AVG_{PS} and WAR_{PS} was estimated at 4.48 ($t(29) = 15.255$, $p < .001$; $t(29) = 15.249$, $p < .001$), which is similar to mean annual salary of 4.54. As slope means (γ_{10}) of AVG_{PS} and WAR_{PS} were 10.099 ($t(29) = 15.941$, $p < .001$) and 0.333 ($t(29) = 9.303$, $p < .001$), respectively, and the positive relationship between AVG_{PS} and WAR_{PS} was statistically confirmed, the higher the AVG_{PS} and WAR_{PS}, the higher the annual $salary_{CS}$ (Hypothesis 1 is supported).

Additionally, variances (u_3) of AVG_{PS} and WAR_{PS} were 908.446 (χ^2 (29) = 102.569, $p < .001$) and .109 (χ^2 (29) = 54.208, $p < .01$). This means characteristics of a group can explain the amount of AVG_{PS} and WAR_{PS} predicting that personal annual $salary_{CS}$ exists. Accordingly, the second step of the HLM intercept and slopes-as-outcomes model was conducted.

An intercept and slopes-as-outcomes model was analyzed to determine what effect the influence created by independent variables of Level 1, AVG_{PS} and WAR_{PS}, on the dependent variable, annual $salary_{CS}$, has on characteristics of team level (ITP, TP, ITD, TD). When Level 2 variables such as ITD and TD were inserted, results showed that γ_{32} of the moderating variable ($AVG_{PS} \times Performance\ Level_{PS}$) slope ($\beta_{3j}$) is not statistically significant at 0.728 ($t(27) = 1.650$, $p = .110$) but γ_{31} of the moderating variable ($WAR_{PS} \times Performance\ Level_{PS}$) slope ($\beta_{3j}$) is statistically significant at 0.130 (t

(27) = 2.228, $p < .05$); a three-way interaction graph was created to interpretdirect ionality (Figure 1). Teams were grouped into a high group, for WAR_{PS} mean or greater, and low group, for below the mean, and into top five teams (LTD group) and bottom five teams (STD), in terms of the slope of annual salary standard deviations, among 30 teams.

The three-way interaction graph indicates that the slope, which predicts individual annual $salary_{CS}$, becomes steeper for LTD than for STD, when the WAR_{PS} of the top performer increases. In contrast, prediction level of WAR_{PS} on individual annual $salary_{CS}$ is similar regardless of the level of TD for low performer (Hypothesis 4 is supported). However, the same results as TD were not observed in ITP and TP.

Testing group effect in pitchers

Analyzed mean annual salary of 3,288 pitchers was $3.91 million USD. Slope of mean annual salary of the 30 MLB teams for 12 years was .21, and that of standard deviations was .18, which has been steadily increasing for 12 years. Intercept of mean annual salary of the 30 MLB teams for 12 years was 1.91, and intercept of standard deviations was 2.21.

To test Hypotheses 1, random coefficient model analysis was conducted to examine if the slope, in which ERA_{PS} and $WHIP_{PS}$ predict annual salary, influences the group level. Mean of β_{0j} (γ_{00}) of independent variables ERA_{PS} and $WHIP_{PS}$ was estimated at 3.884 ($t(29) = 19.792$, $p < .001$; $t(29) = 19.788$,

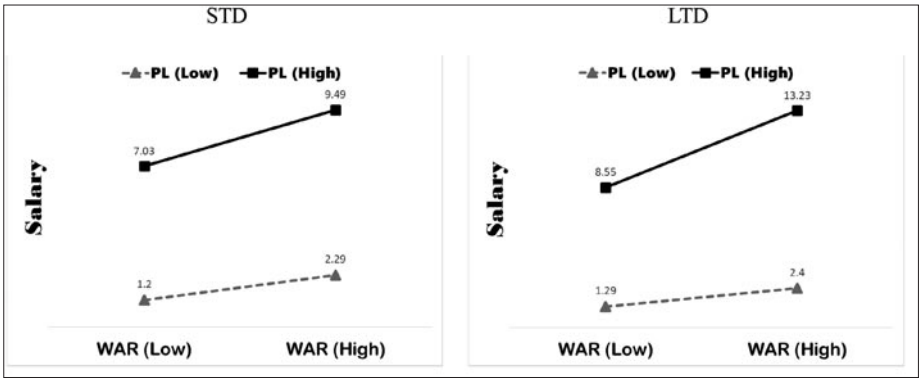

Fig. 1. Three-Way Interaction Graph 1.
[Note] PL = performance level; STD = small teammate discrepancies; LTD = large teammate discrepancies

p <.001), similar to mean annual $salary_{CS}$ of 3.91. As slope means (γ_{10}) of ERA_{PS} and $WHIP_{PS}$ were -0.152 ($t(29) = 3.634$, $p < .001$) and -1.119 ($t(29) = 4.494$, $p < .001$), respectively, and negative relationship between AVG_{PS} and WAR_{PS} was statistically confirmed, the lower the ERA_{PS} and $WHIP_{PS}$, the higher the annual $salary_{CS}$ (Hypothesis 2 is supported).

Additionally, variance (u_3) of ERA_{PS} and $WHIP_{PS}$ were 0.639 ($\chi^2(29) = 105.549$, $p < .001$) and 11.657 ($\chi^2(29) = 78.473$, $p < .001$). This means that characteristics of a group can explain amount of ERA_{PS} and $WHIP_{PS}$ predicting that personal annual $salary_{CS}$ exists. Accordingly, the second step of the HLM intercept and slopes-as-outcomes model was conducted.

An intercept and slopes-as-outcomes model was analyzed to determine what effect influence created by independent variables of Level 1, ERA_{PS} and $WHIP_{PS}$, on the dependent variable, annual $salary_{CS}$, have on characteristics of team level (ITP, TP, ITD, TD). When Level 2 variables such as ITD and TD were inserted, results show that γ_{32} of the ERA_{PS}×*Performance Level*$_{PS}$ moderating variable slope (β_{3j}) is not statistically significant at -0.023 (t (27) = 0.149, p = .882) but γ_{32} of the $WHIP_{PS}$×*Performance Level*$_{PS}$ moderating variable slope (β_{3j}) is statistically significant at -1.214 (t (27) = 2.362, p < .05); a three-way interaction graph was created to interpret directionality (Figure 2). Teams were grouped into a high group, for $WHIP_{PS}$ mean or greater, and low group, for below the mean, and into top five teams (LTD) and bottom five teams (STD), in terms of slope of annual salary standard deviations, among 30 teams.

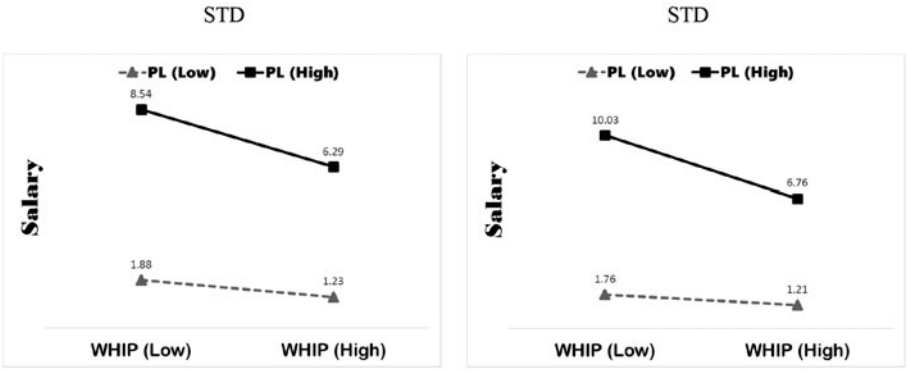

Figure 2. Three-Way Interaction Graph 2.
[Note] PL = performance level; STD = small teammate discrepancies; LTD = large teammate discrepancies

The three-way interaction graph indicates that for the top performer, individual annual $salary_{CS}$ increases with decreases in $WHIP_{PS}$; such a tendency is stronger for the LTD than for the STD. In contrast, the prediction level of $WHIP_{PS}$ on individual annual $salary_{CS}$ is similar, regardless of the level of TD for the low performer (Hypothesis 5 is supported). However, such a phenomenon is not observed in ITP and TP.

Discussion

Motivation gain in the Köhler effect is caused by low performers under the condition that discrepancy between one's ability and one's coworker's ability moderates. In contrast, social compensation induced motivation gain in the high performer. Thus, this study investigated which theory is appropriate in real-world sports by finding existence of motivation gain.

The result of the investigation of the effect of motivation gain on batters and pitchers showed a positive relationship between individual annual $salary_{CS}$ and WAR_{PS} and $WHIP_{PS}$ (Level 1), and is influenced by Level 2 variables TD. The result of the investigation with addition of *PL* showed social compensation, rather than the Köhler effect. When a high-performing batter or pitcher chooses a team whose standard deviation of annual income had been increased, performance improvement can be considered due to social compensation, in which the batter or pitcher will think he/she has to work harder, because other members are less skilled.

Results show that social compensation exists only in *WAR* and *WHIP*, and effects of *AVG* and *ERA* are not verified. One reason for this is because *AVG* and *ERA* are numbers that do not sufficiently represent personal skill, when compared to *WAR* and *WHIP*. In baseball, walks, sacrifice bunts, and sacrifice flies are integral for a team to win, and are individual skills; *AVG* cannot measure such abilities but *WAR* can. Additionally, *ERA* is the percentage of runs per nine innings, and *WHIP* is an index showing how many players walked and hit per inning; *ERA* has a higher dependency on other team pitchers than does *WHIP*. For example, after the starting pitcher advances two runners, if the replacement pitcher allows safe hits or home runs, the lost points for the two runners will be the share of the starting pitcher. Thus, *ERA* of the starting pitcher will increase. As such, it is difficult to consider *ERA* an index that purely represents an individual's ability, as it is determined by dependency on the team pitcher. Thus, as a mutual compensation effect exists in measured data that sufficiently represents individual ability, data collection with consideration given to that point is needed in future research.

It is possible that salary is an indirect indicator of performance that reflects a number of factors other than performance, including years in the league and number of years since becoming a free agent. HLM allows analysis that includes significant omitted variables that may affect annual salary (Raudenbush et al., 2011). This means that the analysis has been conducted in consideration of variables not included, but that affect personal annual salary.

In this analysis, two data modification steps have been followed to eliminate bias (e.g., super rookies and injured players), which affects results of this study. First, Table 1 indicated that modification step 1 includes the process that eliminates data showing incongruity, personal records based on annual salary, and injury, trade, or minor league demotion. Second, the current season's salary is influenced by the objective measure of performance from previous seasons. So some of the low-paid super rookies with outstanding performance compared to salary have been removed in modification step 2, since there is no previous season record. Through the two-step modification process, there has been a positive effect on the validity of the study.

However, since Level 2 variables such as ITP, TP, ITD and TD have been calculated based on modification step 1, there is a possibility that low-paid super rookies may be included in the analysis. If a team has low-paid super rookies, when Level 2 variables, ITP and TP are entered into analysis, γ_{31} or γ_{32} should be statistically significant, and it should appear that tendency of the relationship between personal records and performance was becoming stronger in subordinate performers, because low-paid super rookies have been classed as low performers in this study. However, results of this study did not find statistical significance in γ_{31} or γ_{32}, or contradictory phenomenon in Figure 1 or Figure 2. Specifically, when a low performer played on a team indicating high ITD or TD, a tendency to strengthen the relationship between a low performer's personal record and performance should be observed, but this was not the case. Thus, it is possible to conclude that validity and reliability issues of results of this study that may be caused by low-paid super rookies would be minimal.

Williams and Karau (1991) stated that an important condition for inducing social compensation is that the collective goal should be perceived as valuable and, according to expectancy value theory, an individual will work hard if the task is integral to making an effort. However, he/she will not work hard if the task is menial. Accordingly, this study found presence of social compensation in which a high performer makes more effort when the performance of his/her team members is lower than his/her because of the clear collective goal and the honor and wealth that can be enjoyed, as MLB is the best baseball league in the world.

In contrast to our expectations, the Köhler effect was not observed in data on MLB. Why? First, the Köhler effect is induced by indispensability to effort and goal-setting version of social comparison in conjunctive tasks in which output is determined by less-capable group members (Messé et al., 2002). Thus, the effect may occur in MLB-related activities likened to conjunctive tasks. When do such conjunctive tasks occur in MLB? In other words, when do low-performers play a significant role in contributing to the success of the team or game winning? Their contribution increases during post-season, compared with the regular season. In a post-season tournament, top-ranking teams compete to win a season, and performance levels of high-performers in each team are similar. Given greater impact of performance of low performers on team's success and game winning, a post-season tournament can be defined as a conjunctive task, and low-performing players may exert more effort as a result of the Köhler effect. However, this study used data on regular seasons and found only social compensation without the Köhler effect because regular season games are more likely disjunctive. Future studies must explore post-season data to investigate if the Köhler effect exists.

In previous studies on motivation gain, experiments were conducted with study populations recruited for objectives of each study using arm-lifting persistence task (Kerr et al, 2007, 2008; Kerr & Seok, 2011) and vigilance task (Abele & Diehl, 2008 and others). The purpose of these experiments was to identify the Köhler effect or social compensation in small groups (n= two or four each). Another study (Osborn et al., 2012) used sports players divided into groups (n = four each) to investigate the effect of group motivation gain. The use of small groups to address motivation gain in previous research is justified by the fact that group motivation gain is more dependent on perceptual presence of performance level of group members, importance of group goals or value (e.g., group success or winning) and underlying conditions (e.g., conjunctive task) than number of group members (Messé et al., 2002; Williams & Karau, 1991). In this study, we used a large group of baseball players in the sports field and HLM for statistical analysis to investigate motivation gain phenomena in a departure from previous research.

This study also used MLB archival data in a differentiated approach to group motivation gain, when compared to previous studies. However, in comparison with experimental research, this study has validity and reliability issues in terms of study procedures and analysis methods. To overcome these limitations and make findings more valid and reliable, further studies must use archival data on various sports (e.g., NBA, NFL and so forth).

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