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Recruitment Sources and Posthire Outcomes for Job Applicants and New Hires: A Test of Two Hypotheses

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Abstract

This study, unlike most recruitment source research, tested for and ruled out the contaminating effects of prescreening and self-selection bias by examining applicants and new hires for nursing positions (S. L. Rynes and A. E. Barber, 1990). Consistent with the predictions of A. Rees (1966) and J. C. Ullman (1966), recruitment sources reached differently qualified applicants in terms of nursing experience and education which, in turn, were valid predictors of subsequent nurse performance. In a similar manner, recruitment sources produced sharply different levels of prehire knowledge, which was inversely related to voluntary turnover after 1 yr. However, contrary to both hypotheses, prehire knowledge, education, and experience did not mediate the relationship between recruitment sources and posthire outcomes. Recruitment sources with greater prehire knowledge did not always result in lower voluntary turnover. Likewise, despite recruitment source differences in nursing experience and education, recruitment sources were not related to nursing performance. Finally, the extent to which applicants use multiple recruitment sources was investigated, and the methodological problem that this creates for recruitment source research was discussed.

For more than 30 years, researchers have studied the relationship between recruiting sources and organizational outcomes such as performance, absenteeism, tenure, and turnover. Although it had traditionally been believed that formal sources (i.e., newspapers, employment agencies, etc.) were a superior means for recruiting applicants (S. Cohen, 1960), Rees (1966) and Ullman (1966) argued that informal recruiting sources (i.e., employee referrals, rehires, etc.) were better sources for both applicants and employers. Indeed, their arguments laid the foundation for the two prevalent explanations linking recruitment sources and posthire outcomes.

The first explanation, known as the differential information hypothesis, suggests that informal sources provide job seekers with in-depth, "intensive margin" information about jobs and employers. For example, Ullman (1966, p. 31) suggested that employee referrals were an effective recruiting source because "the friends of employees know more about the company in advance and are almost pre-sold on it if they decide to apply." Rees (1966) and Ullman (1966) also predicted that the information provided by informal sources would promote better applicant–job match which, in turn, would lead to reduced turnover and improved performance. Accordingly, these benefits would not derive from formal recruitment source because they provide less information about employers.

Although research indicates that informal sources provide more accurate information (Breaugh & Mann, 1984; Quaglieri, 1982) and are moderately associated with lower turnover (Decker & Cornelius, 1979; Gannon, 1971; Reid, 1972; Ullman, 1966) and higher performance (Blau, 1989; Breaugh & Mann, 1984; Breaugh, 1981), most studies comparing the effects of formal and informal recruitment sources have not directly measured applicants' prehire knowledge about organizations or jobs. This is a critical omission because Rees and Ullman effectively hypothesized that prehire knowledge mediates the effects of recruitment sources on posthire organizational outcomes. In other words, after controlling for differences in prehire information, recruitment sources should have nonsignificant or small direct effects on posthire outcomes such as performance and turnover. Several studies have measured prehire knowledge but were flawed because measurement occurred after employees were hired (Blau, 1989; Breaugh & Mann, 1984; Hill, 1970). However, Conard and Ashworth (1986) measured prehire knowledge at the time of job application, finding a significant relationship between recruitment source (newspaper advertisements vs. employee referrals) and employee turnover after partialing the effects of prehire expectations. Thus, to date, just one study has properly tested (and not supported) the mediated form of Rees and Ullman's differential information hypothesis.

The second explanation for recruitment source effects on posthire organizational outcomes is differences in applicant populations. This hypothesis suggests that recruiting sources systematically yield applicants that differ on job-relevant individual differences. Rees and Ullman first suggested this idea when they predicted that informal recruitment sources, especially employee referrals, would yield more capable workers. More specifically, they suggested that current employees would "do a good job of prescreening" (Ullman, 1966, p. 31) because "they may feel their own reputation is affected by the quality of the referrals" (Rees, 1966, p. 562).

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Schwab (1982, p. 114) developed this idea further by proposing that "organizations should focus on identifying the method(s) that taps into the population with the most satisfactory base rate(s) (i.e., the percentage of applicants who would be successful if hired)." Schwab's clarification and extension is significant, first, because it implies that recruitment research must include an examination of both applicants and new hires. Both groups must be examined because new hires, either due to initial screening procedures (Alexander, Barrett, & Doverspike, 1983; Boudreau & Rynes, 1985) or nonrandom self-selection (Premack & Wanous, 1985), may not be representative of the applicants obtained during recruitment. With the exception of a Life Insurance Marketing and Research Association report (1962), only one study has examined recruiting source differences for job applicants *and* new hires (Kirnan, Farley, & Geisinger, 1989). Second, Schwab's clarification establishes that, after examining new hires and applicants, those individual differences must then be related to posthire organizational outcomes if the applicant population difference hypothesis is to be supported. Thus, similar to the differential information hypothesis, performance-relevant applicant population differences are predicted to mediate the effects of recruitment sources on posthire outcomes (Taylor & Schmidt, 1983).

Three studies have tested the applicant population mediation hypothesis, but only with new hires and not with applicants. After controlling for height, weight, date of birth, sex, previous rate of pay, and shift preference among 293 seasonal employees (June to December) in a packaging plant, Taylor and Schmidt (1983) found that recruiting sources explained additional variance in performance ($\Delta R^2 = .06$) but not in tenure or attendance. Blau (1989) found that recruitment sources explained significant variance in performance for bank tellers ($\Delta R^2 = .07$ for dollar shortages, and $\Delta R^2 = .06$ for productivity) after controlling for number and name comparison abilities and realistic expectations, with walk-ins being much more qualified than new hires obtained through employee referrals or newspaper advertisements. Thus, in these two studies, the effects of recruitment sources on performance were only partially mediated by individual characteristics. In contrast, Conard and Ashworth (1986) found that applicant population differences fully mediated the effects of recruitment sources on turnover for a sample of life insurance agents. Specifically, the negative relationship between turnover and recruitment source (coded 0 for advertisements, and 1 for employee referrals; $r = -.116, p \leq .01$) was smaller and not significantly different from zero after partialing the effects of employee aptitudes ($r = -.051$, *ns*).

In this study, we provided a more complete test of both recruitment source hypotheses. First, the differential information and applicant population difference hypotheses were tested by using job applicants and new hires for nursing positions. Examination of both groups enabled us to test for the confounding effects of prescreening and applicant self-selection that cannot be detected in recruitment studies that rely solely on new hires (Rynes & Barber, 1990). Second, the differential information hypothesis was tested by assessing the effects of recruitment sources after controlling for differential information, which was measured at the time of job application. Third, the applicant population difference hypothesis was tested by entering recruitment sources after controlling for job-relevant individual differences in education and experience. The validity of education and experience for predicting posthire performance has been demonstrated in a series of meta-analytic

studies (Hunter & Hunter, 1984; McDaniel, Schmidt, & Hunter, 1988; Schmidt, Hunter, & Outerbridge, 1986). Studies of nurse performance also indicate that years of nursing education is positively correlated with job performance (Jacobs, 1980; McCloskey, 1983; Schwirian, 1978). In a similar vein, the development of nursing preceptorship programs in which inexperienced nursing graduates work closely with and are trained by experienced clinical nurses suggests that nursing experience is positively related to job performance (Clayton, Broome, & Ellis, 1989; Limon, Spencer, & Waters, 1981).

Finally, we made a preliminary investigation of a potential methodological problem relevant to all recruiting source research, that is, interaction between treatment effects (Cook & Campbell, 1979). In recruitment source research, study participants are subject to more than one treatment effect if they have been exposed to or use several sources of recruiting information to find out about job openings (Stone & Williams, 1990). This seems likely considering that Reid (1972), Azevedo (1974), and Dayton (1981) have found that job seekers tend to use multiple information sources. For example, assume a presently employed computer programmer becomes interested in a job opening after reading an advertisement in the newspaper. Remembering that a neighbor works for that company, but in manufacturing, he calls to find out as much as possible about the company and, if possible about the job. To which recruiting source, newspapers or employee referrals, does one attribute knowledge about the job and organization? A similar question is, to which source is this applicant assigned when examining job-relevant individual differences across recruitment sources? In such cases, assignment of applicants to just one recruiting source clearly overestimates the effects of reported sources, whereas it underestimates the effects of unreported sources. The scope of this potential confound was determined in this study by asking applicants to report all the recruiting sources they had used to learn about job openings.

Method

Sample and Procedure

After obtaining permission from the state hospital association, the nursing administrators' association, and the nurse recruiters' association, we contacted all the hospitals in a southwestern state. Approximately half agreed to participate in the study. Of those 32 hospitals, 16 were located in metropolitan areas, 4 were in small cities with populations between 50,000 and 70,000, and 12 were in towns of less than 50,000. The median-size hospital had approximately 250 beds, although six were under 100 and seven had over 300.

Questionnaire data were collected as part of the initial job application process by nurses seeking employment between February and April of 1987. Confidentiality was assured as participants sealed their responses in postage-paid return envelopes, which were then mailed directly to the university research team. Unfortunately, reliance on hospital recruiters for distribution of study questionnaires prevented formulation of a precise response rate. On the basis of the number of unused questionnaires returned by hospital recruiters following study completion, we estimated that approximately 900 questionnaires were distributed to applicants. Four hundred and sixty-

seven nurse applicants mailed questionnaires to the university research team, yielding an estimated 52% response rate. Two-hundred thirty-four of those 467 applicants were eventually hired.

Measures

Recruiting sources

In contrast to previous research that assumed use of only one recruitment source, nurse applicants were asked to indicate, "From what sources did you hear about this position? Please check all that apply." Choices included: referred by a current or former employee, did student-clinical rotation at this hospital, worked here previously (rehires), campus visit by a hospital's nurse recruiter, newspaper or other advertisement, or walk-in without prior knowledge of an opening.

Assuming one applicant per source, recruitment sources (g) have typically been coded as $g - 1$ dummy variables (J. Cohen & Cohen, 1983, p. 182). However, dummy coding cannot be used in recruitment research if applicants use multiple sources because that violates the formal requirement "that the observations be assignable to g mutually exclusive and exhaustive categories, that is, that each case be assigned to one (and only one) of the g groups" (J. Cohen & Cohen, 1983, p. 183). One method of adapting dummy coding to multiple-source use is to treat each unique combination of multiple sources as a mutually exclusive category. For example, applicants who used clinical rotation and advertisements would be in a separate category from applicants who used clinical rotation and employee referrals. This way, the six original recruiting sources (g) and their unique, mutually exclusive combinations (c) could be combined to create $g + c - 1$ variables for dummy coding.

Unfortunately, statistical power considerations precluded this coding scheme because of the large number of unique combinations. For example, roughly 75% of the applicants and new hires who reported using multiple sources used just two sources. For those individuals alone, there were 8 unique combinations of the six original recruiting sources. Furthermore, there were 8 unique combinations of the six original recruiting sources for those applicants and hires who reported using three or more recruitment sources. Thus, the 16 unique recruitment source combinations, combined with the six original recruitment sources, would be much too large given the sample size of our data set.

Because of this restriction, all multiple-source combinations were recoded into one of the three mutually exclusive categories. If participants used combinations of the rehire, clinical rotation, and employee referral recruitment sources, they were categorized as multiple informals. If participants used both campus interviews and advertisements, they were categorized as multiple formals. However, the multiple formal source was excluded from analyses because only four applicants used this combination. If participants combined a formal source with an informal source, they were categorized as mixed multiples. Walkins were not included in any multiple-source category because none of the nurses who categorized themselves as walk-ins reported using any other recruitment source.

Although this coding scheme obviously discarded information regarding the 16 unique combinations of multiple sources, it increased the power of our statistical analyses and permitted an exploratory investigation of the effects of multiple versus single recruitment sources. Moreover, the informal–formal source dichotomy is a well-recognized theoretical distinction in the recruitment source literature.

Prehire organizational knowledge

Participants reported their perceptions of how much they knew (1 = *nothing*, 5 = *a great deal*) about a hospital's reputation, pay and benefits, specific working conditions, the type of nursing practiced, what the staff nurses were like, and what the nursing supervisors were like. Those six, 5-point Likert scale items were summed to obtain a total score. The internal consistency reliability for this measure was .91.

Experience

Participants self-reported the number of years of experience they had "as a registered nurse."

Education

Given the relative number of years of education required for each nursing degree, education was coded 1 for associate, 2 for diploma, 3 for baccalaureate, and 4 for masters. Typically, associate degrees take 2 years to complete, diploma degrees take 3 years, baccalaureate degrees take 4 years, and master's degrees take 5–6 years to complete.

Voluntary turnover

One year after questionnaire data were collected, each hospital indicated which nurses had quit. Because involuntary quits were excluded from this analysis, the rate of voluntary turnover (58 of 190) among new hires was 30.5%.

Performance

Performance, which was also rated 1 year after initial data collection, was available only for those nurses who were still employed by the participating hospitals. Immediate supervisors rated the performance of the remaining nurses by using the Schwirian (1978) Scale of Nursing Performance. Although none of the hospitals were using this scale for formal performance evaluation, it was used to ensure that all nurses were rated with the same instrument. Because of differences in job requirements, some nurses were not required to perform all of the activities listed within Schwirian's six dimensions of nursing performance: leadership (α = .91), critical care (α = .95), teaching and collaboration (α = .95), planning and evaluation (α = .95), interpersonal relations and communication (α = .96), and professional development (α = .96). Accordingly, raters were given a *does not apply* option for each item. As a result, averaged performance scores were created by summing the scores on all items relevant to each nurse's position and then dividing by the number of relevant items. On a scale of 1 to 4, averaged performance scores ranged from 1.38 to 4.00, had a mean of 2.82, and a standard deviation of 0.61.

Analysis

There were four parts to the data analysis. First, descriptive data indicating the number of applicants and new hires using particular recruitment sources are reported. Second, the scope and consequence of interaction between treatment effects (i.e., use of multiple sources) was assessed. Third, possible prescreening and applicant self-selection effects were tested by comparing applicants with new hires on education, experience, prehire knowledge, and recruitment source use. Similar results across these groups would indicate that the biasing effects of prescreening or self-selection were small. Finally, hierarchical regression analysis was used to determine if recruitment source effects on turnover and performance are mediated by education, experience, and prehire knowledge.

Results

Table 1 shows that each source produced approximately the same percentage of applicants and new hires. Four sources, advertisements, walk-ins, mixed multiples, and employee referrals, accounted for approximately 75% of applicants and new hires. Yield ratios indicated that fewer than half of the applicants obtained from those sources were hired. The four remaining sources, multiple informals, rehires, campus interviews, and clinical rotation, accounted for only 25% of applicants and hires. Except for campus interviews, yield ratios indicated that hospitals hired over 60% of the applicants from those sources.

Table 1
Number of Applicants and New Hires by Recruitment Source

Recruitment source	Applicants	New hires	Yield ratio (%)
Walk-in			49
N	74	36	
% recruited	20	20	
Rehire			78
N	23	18	
% recruited	6	10	
Campus interview			40
N	20	8	
% recruited	5	4	
Advertisement			40
N	116	46	
% recruited	31	25	
Clinical rotation			61
N	18	11	
% recruited	5	6	
Employee referral			47
N	43	20	
% recruited	11	11	
Multiple informals			65
N	26	17	
% recruited	7	9	
Mixed multiples			48
N	54	26	
% recruited	14	14	

Note. Yield ratio is the number of hires divided by the number of applicants for each recruitment source. Percentages, which have been rounded, indicate the proportion of applicants or new hires generated by a recruitment source.

Interaction Between Treatment Effects

Table 1 also indicates that interaction between treatment effects can pose a problem in recruitment source research, as 21% of applicants and 23% of new hires used two or more recruitment sources. Table 2, which provides a breakdown of the different combinations of recruitment sources among multiple-source users, shows that there were 4 different combinations of multiple informal sources and 12 different combinations of mixed multiples. The most frequent multiple informal source combination was clinical rotation and employee referral. The most frequently used mixed multiple-source combinations were advertisements and clinical rotation, advertisements and employee referral, and campus interviews and clinical rotation.

Table 2
Breakdown of Multiple Recruitment Source Combinations

Recruitment source	Multiple informals				Mixed multiples											
Rehire	X	X		X	X		X	X	X							X
Campus interview						X	X		X					X	X	X
Advertisement					X						X	X			X	X
Clinical rotation	X		X	X		X			X	X	X		X	X	X	X
Employee referral		X	X	X		X							X	X	X	X
N applicants	5	5	11	5	5	10	10	1	12	3	3	1	1	6	1	1
N new hires	4	3	7	3	3	4	4	1	6	0	1	1	1	2	1	1

Note. Read vertically, X denotes multiple recruitment source combinations. For example, the fifth column indicates that 5 applicants and 3 new hires were rehires (an informal source) who responded to an advertisement (a formal source) about a job opening.

Two analyses were used to test our assertion that the standard practice of asking study participants to report "the" recruitment source used to find out about a job can result in misestimation of recruitment source effects whenever job candidates use multiple sources. In the first analysis, both multiple recruitment source categories were collapsed and multiple-source users were recoded as using only one recruitment source. Because we did not know which single recruitment source participants would have chosen had they been asked to check just one source, this was accomplished by randomly assigning each multiple-source user to one of their multiple recruitment sources. For example, half of the applicants who used both the clinical rotation and employee referral sources were randomly assigned to just the clinical rotation source, whereas the other half were assigned to just the employee referral source.

Figure 1 indicates that assigning multiple recruitment source users to only one source can produce large changes in the effects attributed to particular recruitment sources. For example, when the distinction between multiple- and single-source users was maintained (designated as *original sources* in Figure 1), rehires, campus interviews, advertisements, and employee referrals had over 30% turnover after 1 year, whereas clinical rotation, multiple informals, and mixed multiples had less than 20% turnover. Yet, when multiple-source users were randomly assigned to just one of their multiple sources (designated as *one source* in Figure 1), the turnover rates ostensibly associated with single recruitment sources changed from 33% to 28% for rehires, from 38% to 21% for campus interviews, from 9% to 22% for clinical rotation, and from 40% to 27% for employee referrals. There was no appreciable change in the rate of turnover among nurses recruited through advertisements (from 38% to 37%) and, of course, there was no change whatsoever among walk-ins   because   they   did   not   use   multiple   sources.
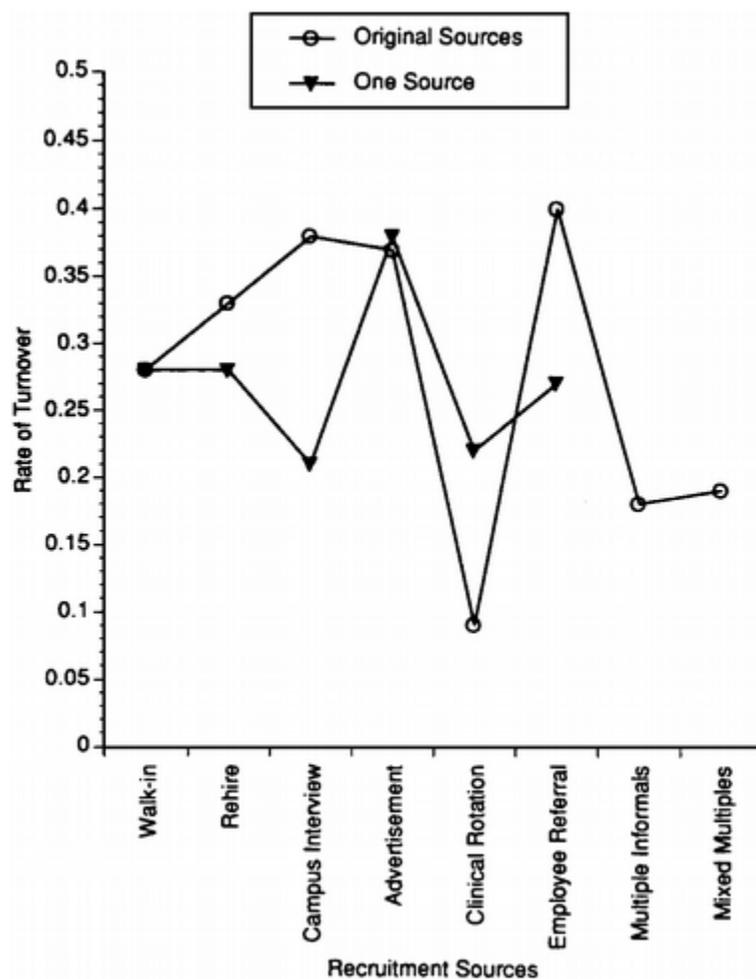
Figure 1. Turnover rate by recruitment source. (Original sources represents the turnover rates for the six single-source and the two multiple-source categories. One source represents the rate of turnover after each multiple-source user was randomly assigned to just one of their multiple-recruitment sources.)

The second analysis examined whether multiple-source applicants who used a combination of two sources, for example, clinical rotation and employee referrals, were different from applicants who used just one of those sources. Differences between such groups would also indicate that forcing applicants to identify "the" recruitment source or "a" recruitment source can lead to misestimation of effects. Due to small sample sizes in multiple-source groups, the analysis was restricted to the four largest multiple-source combinations for applicants using two sources. Furthermore, we examined differences in applicant experience and prehire knowledge, but not applicant education, because additional contrasts (which are discussed later) indicated that there were few recruitment source differences in education.

Table 3, which presents recruitment source means, standard deviations, and Student-Newman-Keuls (SNK) contrasts, shows that applicants using two sources often had levels of experience or prehire knowledge that were different from applicants who reported using just one of those sources. Such differences indicate that multiple-source users can be significantly different from single-source users and that forcing applicants to designate "the source" used to find out about a job opening could result in misestimation of recruitment source effects.

Table 3
Student-Newman-Keuls Multiple-Range Comparisons of Applicants Using Two Sources With Applicants Using Just One Source

Recruitment source	Experience						Prehire knowledge		
	N	M	SD	1	2	3	N	M	SD
1. Clinical rotation + employee referral	10	0.90	2.02	—	2.41	4.38*	8	20.88	4.82
2. Clinical rotation	18	2.11	3.41	1.21	—	1.97	17	18.47	3.89
3. Employee referral	34	7.62	7.36	6.72*	5.51*	—	26	16.50	4.47
1. Advertisement + clinical rotation	10	2.50	2.95	—	0.24	−5.14*	9	13.33	3.08
2. Advertisement	108	8.40	6.81	5.90*	—	−5.38*	89	13.09	4.19
3. Clinical rotation	18	2.11	3.41	−0.39	−6.29*	—	17	18.47	3.89
1. Advertisement + employee referral	8	9.38	8.88	—	5.58*	2.12	6	18.67	2.66
2. Advertisement	108	8.40	6.81	−0.98	—	−3.46*	89	13.09	4.19
3. Employee referral	34	7.62	7.36	−1.76	−0.78	—	26	16.55	4.47
1. Campus interview + clinical rotation	12	0.00	0.00	—	5.86*	2.95	12	21.42	3.18
2. Campus interview	20	0.70	3.13	0.70	—	−2.91	18	15.56	5.40
3. Clinical rotation	18	2.11	3.41	2.11	1.41	—	17	18.47	3.84

Note. Values in the table represent the difference between paired means. Those below the diagonal are for years of experience; those above the diagonal are for prehire knowledge. Specifically, each row mean is contrasted with the column mean, the latter of which serves as the referent in each comparison. For instance, below the diagonal in column 1, applicants using employee referrals had significantly more experience than applicants using clinical rotation and employee referrals (i.e., 7.62 − 0.90 = 6.72). Above the diagonal in column 3, applicants using clinical rotation and employee referrals reported significantly more prehire knowledge than applicants using employee referrals (i.e., 20.88 − 16.50 = 4.38).
* $p \leq .05$.

Prescreening and Self-Selection Bias

Applicants and new hires were compared to determine if there was prescreening or self-selection bias. The possibility of bias is smaller to the extent that applicants and new hires are similar.

Multiple regression indicated that, among applicants, recruitment sources collectively accounted for sizeable variance in prehire knowledge ($R^2 = .27$, $p \leq .01$, $n = 318$), moderate differences in experience ($R^2 = .13$, $p \leq .01$, $n = 365$), and nonsignificant differences in education ($R^2 = .03$, *ns*, $n = 362$). Similar results were obtained for new hires on prehire knowledge ($R^2 = .30$, $p \leq .01$, $n = 142$) and experience ($R^2 = .15$, $p \leq .01$, $n = 176$) but not for education, where moderate differences were now observed ($R^2 = .09$, $p \leq .05$, $n = 179$). Likewise, turning from overall to specific

relationships, Table 4 shows that the correlations between recruitment sources and the hypothesized mediators, education, experience, and prehire knowledge, were nearly the same for applicants and new hires.

Table 4
Intercorrelations Among Study Variables for Applicants and New Hires

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Education	—	.23*	.08	−.05	.22*	.02	−.03	.01	−.04	.13*	−.18*	.21*	−.06
2. Experience	.18*	—	−.19*	.08	.06	−.18*	.21*	−.17*	.11	−.16*	−.13*	.22*	.01
3. Prehire knowledge	−.03	−.16*	—	−.24*	.27*	.01	−.32*	.09	−.04	.29*	.22*	−.05	−.25*
4. Walk-in	−.03	.04	−.16*	—	−.16*	−.10	−.27*	−.12*	−.17*	−.15*	−.19*	.06	−.03
5. Rehire	.11*	.07	.23*	−.12*	—	−.07	−.18*	−.08	−.11	−.10	−.13*	.11	.02
6. Campus interview	.00	−.18*	−.03	−.11*	−.06	—	−.12	−.05	−.07	−.07	−.08	−.03	.03
7. Advertisement	.00	.23*	−.36*	−.31*	−.16*	−.15*	—	−.14*	−.19*	−.18*	−.23*	.09	.08
8. Clinical rotation	.00	−.13*	.10*	−.11*	−.05	−.05	−.14*	—	−.09	−.08	−.10	.07	−.12
9. Employee referral	−.03	.08*	.02	−.17*	−.09*	−.08*	−.23*	−.08*	—	−.11	−.14*	−.11	.07
10. Multiple informal sources	.08*	−.11*	.25*	−.13*	−.07	−.06	−.17*	−.06	−.09*	—	−.12*	−.08	−.09
11. Multiple mixed sources	−.12*	−.15*	.29*	−.19*	−.10*	−.09*	−.26*	−.09*	−.14*	−.11*	—	−.11	−.10
12. Performance	—	—	—	—	—	—	—	—	—	—	—	—	—
13. Voluntary turnover	—	—	—	—	—	—	—	—	—	—	—	—	—

Note. Correlations below the diagonal are for applicants; those above the diagonal are for new hires. Samples sizes vary across correlations: for applicants, $Ns = 311–374$; for new hires, $Ns = 97–182$. Although the recruitment sources were coded into seven dummy variables (i.e., $g − 1$) for regression analyses, correlations are shown for all eight recruitment sources. Each recruitment source correlation represents a comparison between the mean of those using that source and the mean of those using all other sources (J. Cohen & Cohen, 1983).
* $p \le .05$.

Next, sample means and 95% confidence intervals were used to determine if there were significant overall differences between applicants and new hires in levels of education, experience, and prehire knowledge. Overlapping 95% confidence intervals indicated that there were nonsignificant differences between applicants and new hires in education (for applicants, $1.82 \le 1.92 \le 2.02$; for new hires, $1.74 \le 1.89 \le 2.04$) and years of experience (for applicants, $5.33 \le 6.06 \le 6.80$; for new hires, $4.34 \le 5.36 \le 6.37$). In contrast, the 95% confidence intervals for prehire knowledge did not overlap. New hires had greater prehire knowledge ($17.33 \le 18.28 \le 19.22$) than did applicants ($15.65 \le 16.26 \le 16.88$).

Table 5 presents recruitment source means, standard deviations, and SNK contrasts for applicants and new hires, which were used to make specific paired comparisons of recruitment sources on education, experience, and prehire knowledge. The SNK procedure, which requires a significant overall F before testing specific mean contrasts, is recommended when testing all pairs of means because it controls for both familywise and per-comparison Type I errors (Games, 1971). The SNK contrasts indicated no differences in education across recruitment sources for applicants. However, there was one significant but small difference among new hires, as rehired nurses had more education than did mixed multiples. For years of experience, the general pattern among applicants was that walk-ins, rehires, employee referrals, and nurses recruited through advertisements had the most experience, averaging over 6 years. In comparison, multiple informals and mixed multiples

averaged 3 to 3½ years, whereas nurses relying on clinical rotation and campus interviews had the least experience, averaging 2 years and less than a year, respectively. Although there were fewer statistically significant differences due to the smaller sample size, the same pattern of experience differences was also found among new hires. Finally, recruitment source differences in prehire knowledge were also consistent across applicants and new hires. In general, rehires, multiple informals, mixed multiples, and nurses recruited through clinical rotation had greater prehire knowledge than employee referrals, campus interviews, advertisements, or walk-ins.

Table 5
Student-Newman-Keuls Multiple-Range Comparisons of Education, Experience, and Prehire Knowledge for Applicants and New Hires

Recruitment source	N	M	SD	1	2	3	4	5	6	7	8	N	M	SD
						Education								
1. Walk-in	70	1.87	.93	—	-.77	-.21	-.04	-.12	.01	-.50	.33	34	1.79	1.01
2. Rehire	21	2.38	1.16	.51	—	.56	.73	.65	.78	.27	1.10*	16	2.56	1.09
3. Campus interview	19	1.95	1.03	.08	-.43	—	.17	.09	.22	-.29	.54	8	2.00	1.07
4. Advertisement	107	1.93	.92	.06	-.45	-.02	—	-.08	.05	-.46	.37	42	1.83	.85
5. Clinical rotation	18	1.94	1.00	.07	-.44	-.01	0.01	—	.13	-.38	.45	11	1.91	1.04
6. Employee referral	36	1.83	.94	-.04	-.55	-.12	-.10	-.11	—	-.51	.32	18	1.78	.88
7. Multiple informal sources	25	2.24	1.01	.37	-.14	.29	.31	.30	.41	—	.83	17	2.29	1.05
8. Multiple mixed sources	52	1.65	.88	-.22	-.73	-.30	-.28	-.29	-.18	-.59	—	26	1.46	.81
						Experience								
1. Walk-in	71	6.59	7.41	—	-.27	6.38	-1.39	5.38	-1.42	4.45	3.15	34	6.38	6.84
2. Rehire	22	7.95	8.34	1.36	—	6.65	-1.12	5.65	-1.15	4.72	3.42	17	6.65	7.51
3. Campus interview	20	.70	3.13	-5.89*	-7.25*	—	-7.77*	-1.00	-7.80	-1.93	-3.23	8	0.00	.00
4. Advertisement	108	8.40	6.81	1.81	0.45	7.70*	—	6.77*	-.03	5.84*	4.54*	43	7.77	6.84
5. Clinical rotation	18	2.11	3.41	-4.48	-5.84	1.41	-6.29*	—	-6.80	-.93	-2.23	11	1.00	1.90
6. Employee referral	34	7.62	7.36	1.03	-.33	6.92*	-.78	5.51*	—	5.87	4.57	15	7.80	8.64
7. Multiple informal sources	23	2.96	5.84	-3.63	-4.99	2.26	-5.44*	.85	-4.66*	—	-1.30	15	1.93	5.01
8. Multiple mixed sources	52	3.48	5.59	-3.11*	-4.47*	2.78	-4.92*	1.37	-4.14*	.52	—	26	3.23	4.55
						Prehire knowledge								
1. Walk-in	67	14.58	4.71	—	-6.95*	-2.74	1.19	-4.31	-1.51	-7.64*	-5.26*	32	15.69	5.23
2. Rehire	19	21.05	5.17	6.47*	—	4.21	8.14*	2.64	5.44*	-.69	1.69	14	22.64	4.68
3. Campus interview	18	15.56	5.41	.98	-5.49*	—	3.93	-1.57	1.23	-4.90	-2.52	7	18.43	6.60
4. Advertisement	89	13.09	4.19	-1.49*	-7.96*	-2.47	—	-5.50*	-2.70	-8.83*	-6.45*	28	14.50	4.32
5. Clinical rotation	17	18.47	3.89	3.89*	-2.58	2.91	5.38*	—	2.80	-3.33	-.95	10	20.00	3.59
6. Employee referral	26	16.50	4.47	1.92	-4.55*	0.94	3.41*	-1.97	—	-6.13*	-3.75	10	17.20	3.97
7. Multiple informal sources	20	21.45	4.35	6.87*	0.40	5.89*	8.36*	2.98	4.95*	—	2.38	12	23.33	3.28
8. Multiple mixed sources	46	19.93	4.70	5.35*	-1.12	4.37*	6.84*	1.46	3.43*	-1.52	—	22	20.95	4.69

Note. Values represent the difference between paired means. Those below the diagonal are for applicants; those above the diagonal are for new hires. Specifically, each row mean is contrasted with the column mean, the latter of which serves as the referent in each comparison. For example, with applicants, column 1 indicates that rehires had significantly more prehire information than walk-ins (i.e., 21.05 − 14.58 = 6.47). The same result was also obtained for new hires (above the diagonal), but the sign of the difference is reversed because in column 2, rehires are now the referent mean (i.e., 15.69 − 22.64 = −6.95), not walk-ins as in column 1.
* $p \le .05$.

Overall, these analyses indicated that there was only one meaningful difference between applicants and new hires, namely, that new hires had greater prehire knowledge than applicants. There was also a statistically significant difference in education across recruitment sources for new hires (but

not applicants), but that difference was not viewed as substantial because it was limited to one paired contrast indicating that rehires had more education than walk-ins. Although the difference in prehire knowledge suggests the possibility of applicant self-selection, in that applicants with greater prehire knowledge may have been more likely to accept job offers, there were still strong similarities between applicants and new hires. For instance, the magnitude of recruitment sources differences in prehire knowledge was nearly the same for applicants (R^2 = .27) as for new hires (R^2 = .30) . Likewise, despite greater overall prehire knowledge among new hires, the ordering and direction of recruitment source differences in prehire knowledge was nearly the same for new hires as it was for applicants. Given these similarities, and the lack of meaningful differences between applicants and new hires in education and experience, we concluded that the effects of prescreening and self-selection bias were relatively small. Consequently, hypothesis testing, which is conducted only with new hires, should be relatively unbiased.

Hypothesis Testing

Hierarchical regression, with education and experience entered in Step 1, prehire knowledge entered in Step 2, and recruitment sources entered in Step 3, was used to determine if recruitment source effects on turnover and performance were mediated by education, experience, and prehire knowledge. Note that missing data and attrition significantly reduced the available sample sizes in these analyses. The turnover sample size was reduced from 234 hires to 190 by excluding 12 involuntary quits and 32 hires who used nine other recruitment sources with sample sizes that were too small to include in the study. Additional shrinkage from 190 to 141 was due to missing data on prehire knowledge. With respect to performance, we were only able to obtain data from nurses who were still employed after 1 year (n = 190). Because the rate of turnover was 30.5%, we ideally would have obtained performance data on 132 nurses. However, missing data on both the performance and prehire knowledge measures reduced the performance regression equation sample size from 132 to 97.

In Step 1 of the regression analyses, education and experience were unrelated to voluntary turnover (R^2 = .004, ns) but explained 7.7% of the variance ($p \leq$ .05) in nurse performance. At Step 2, prehire knowledge accounted for significant incremental variance in voluntary turnover (ΔR^2 = .063, $p \leq$ .05) but not performance (ΔR^2 = .001, ns) . At Step 3, recruitment sources did not add to the prediction of voluntary turnover (ΔR^2 = .031, ns) or performance (ΔR^2 = .041, ns) . Because recruitment sources did not explain additional unique variance, this pattern of results suggests that education, experience, and prehire knowledge may be acting as mediators. However, another set of hierarchical analyses in which recruitment sources were entered first, before the hypothesized mediators, indicated that recruitment sources were not directly related to either voluntary turnover (R^2 = .031, ns) or employee performance (R^2 = .056, ns) . Thus, strictly speaking, there was no recruitment source effect to mediate.

Discussion

Consistent with the job search literature (Azevedo, 1974; Dayton, 1981; Reid, 1972), our data indicated that job applicants use multiple recruitment sources. When this occurs, the standard practice of identifying "the" recruitment source used by applicants to find out about job openings becomes problematic. For instance, we found that applicants who used two recruitment sources, such as clinical rotation plus employee referrals, were often different in terms of experience and prehire knowledge from applicants who just used clinical rotation or just employee referrals. Consequently, the most basic problem with asking multiple-source users to designate "a" recruitment source is that no effect whatsoever can be ascribed to the second or third source used by applicants or to the combined effects of sources. The likely result is confounded, misestimated, and omitted recruitment source effects. Indeed, when each multiple-source user was randomly assigned to just one of their recruitment sources, the rate of turnover ostensibly associated with each single source changed tremendously, by an average of 10 points per recruitment source. Admittedly, randomly assigning multiple-source users to just one of their recruitment sources is not the same as asking which recruitment source was most important in their decision to apply for a job. Nonetheless, these data strongly suggest that when job applicants use multiple recruitment sources (and over one fifth of the applicants did), attributing the effects of multiple sources to only one source can lead to incorrect estimates of recruitment source effects.

Accordingly, future recruitment source research must test for multiple-source use to avoid possible contamination of recruitment source effects. Then, to ensure construct validity, applicants using multiple sources should be classified separately from applicants using single sources, with each unique combination of multiple sources treated as a mutually exclusive category. Unfortunately, in this study, the small number of applicants and new hires per unique multiple-source combination forced us to collapse the 16 different multiple-source combinations into just two categories, multiple informals and mixed multiples, to conduct exploratory analyses.

Differential Information and Applicant Population Differences

Another purpose of this study was to test the diffential information and applicant population difference hypotheses that attempt to explain the relationship between recruitment sources and posthire outcomes. Based on the work of Rees (1966) and Ullman (1966), it was predicted that (a) recruitment sources differ in the information provided to applicants and in the quality of applicants they yield; (b) there are systematic differences across recruitment sources in posthire outcomes such as voluntary turnover and employee performance; and (c) information and applicant differences mediate, or explain, the relationship between recruitment sources and posthire outcomes.

Consistent with the differential information hypothesis and past research (Breaugh & Mann, 1984; Quaglieri, 1982), there were sizeable differences in prehire knowledge across recruitment sources. Applicants and new hires using at least one informal source reported more prehire knowledge about potential employers than did applicants who relied exclusively on formal recruitment sources. Interestingly, we also found that applicants and new hires who used multiple sources generally reported having more prehire knowledge than those using just one informal source. The

only notable exception to the differential information hypothesis was that employee referrals had less prehire knowledge than rehires, multiple informals, or mixed multiples. Rees (1966), Ullman (1966), and others have generally claimed that employee referrals would provide the most information about potential employers. In contrast, there was much less support with respect to hypothesized applicant population differences. There were moderate recruitment source differences in nursing experience but not in education. Furthermore, applicants using informal sources were no more qualified than applicants using formal sources.

It was also predicted that the recruitment sources used by new hires to find out about job openings would be predictive of voluntary turnover and performance after 1 year, but they were not. These results were somewhat surprising, especially because recruitment sources were related to prehire knowledge and experience which, in turn, were related to voluntary turnover and nurse performance. The third prediction, that recruitment source effects on posthire outcomes are mediated by education, experience, and prehire knowledge, was also not supported. As described earlier, there was no direct effect to mediate because recruitment source effects on posthire outcomes were not statistically significant. However, because our unmediated recruitment source effect sizes were comparable with those found in previous studies, it could be argued that the observed recruitment source effects were meaningful but that the final analyses, which were based on the smaller sample of new hires and not the larger applicant sample, simply lacked adequate statistical power (Sedlmeier & Gigerenzer, 1989). In fact, given the observed effect sizes, seven dummy-coded variables for recruitment sources, and an alpha of .05, the retrospective power levels for recruitment sources were .35 for turnover and .29 for performance.

Yet, even if one assumes that the lack of a statistically significant relationship between recruitment sources and posthire outcomes was a function of weak statistical power, there would still be no support for either the differential information or applicant population difference hypotheses. This is because partialing the effects of education, experience, and prehire knowledge resulted in only marginal attenuation of the *magnitude* of recruitment source effects on posthire outcomes. In fact, the size of the direct recruitment source effect on turnover ($R^2 = .031$) was completely unchanged after controlling for education, experience, and prehire knowledge. In comparison, the direct recruitment source effect on performance ($R^2 = .056$) was attenuated, but only slightly ($R^2 = .041$).

Indeed, if one examines the studies that have properly tested recruitment source effects (i.e., by measuring information or expectations before hire, and by partialing the effects of prehire information and applicant population differences), there is no consistent support for either hypothesis. For example, Conard and Ashworth (1986) also found that controlling for realistic expectations did not appreciably attenuate the relationship between recruitment sources and employee turnover (zero-order $r = .116$; partial $r = .115$). Likewise, consistent with our results, Taylor and Schmidt, (1983) found that direct recruitment source effect sizes on performance (i.e., R^2) were only slightly attenuated from .08 to .06 after controlling for individual characteristics such as height, weight, age, and gender. In a similar vein, Blau (1989) found that recruitment

source effects on two measures of bank teller performance, dollar shortages, and productivity, were attenuated from .10 to .07 and from .08 to .06 after controlling for number and name comparison ability. Although it is far too early to draw firm conclusions, these studies contradict beliefs that prehire information accounts for the relationship between recruitment sources and turnover and that job-relevant applicant population differences account for the relationship between recruitment sources and performance.

Limitations

First, the results of this study may have limited generalizability. One reason is that the clinical rotation source used by hospitals has no direct comparison in other recruitment studies. Another is that the pattern of recruitment source use among nurses may be different because of the strict educational and licensure requirements for nurses or because of the nationwide shortage that makes finding a nursing job relatively easy.

Second, even though the magnitude of the direct and mediated effects was small, weak statistical power represents an alternative explanation for the nonsignificance of those relationships. In other words, after sample attrition and missing data, the final equations used to test the direct and mediated effects had less than a 50–50 chance of detecting the existence of true effects. Therefore, we cannot conclude with scientifically accepted levels of certainty that the direct and mediated effects were nonsignificant.

Third, despite its significant negative relationship with voluntary turnover, our perceptual measure of the amount of prehire organizational knowledge possessed by applicants did not assess whether that information was accurate. One way to assess accuracy would be to have applicants rate organizational characteristics before and after they were hired. Another would be to ask new hires to indicate whether their prehire knowledge was accurate. Yet another way would be to compare applicants' prehire ratings with the ratings of job incumbents. Any of these techniques would provide a stronger test of the differential information hypothesis. However, such data would have been difficult for us to obtain, given that we tracked applicants and new hires across 32 hospitals.

Fourth, gathering a wider range of job-relevant applicant abilities, such as the number and name comparison abilities measured by Blau (1989) in his bank teller recruitment study, would have resulted in stronger tests of the applicant population difference hypothesis. For example, in addition to gathering self-report data on nursing experience and nursing education, we asked the nursing recruiters at each hospital to rate the quality of each applicant and to obtain work histories, that is, the amount of work experience in specific types of nursing units. Unfortunately, we obtained so few of these histories and ratings that they could not be included in the study. Thus, we were only able to conduct a limited test of potential mediators for the applicant population difference hypothesis.

Fifth, because we failed to measure and control for the most common post-hire causes and correlates of voluntary turnover and employee performance, this study, in similar fashion to most recruitment source research, suffered from omitted variables error (Mauro, 1990). We think this is

an important consideration for future research because we suspect that recruitment source effects on turnover and performance may shrink or become negligible once well-supported alternative explanations are controlled in recruitment source studies.

Finally, this study only attempted to determine the relationship between recruitment sources and distal posthire outcomes such as employee performance and voluntary turnover. Thus, the results of this study do not rule out the possibility of a relationship between recruitment sources and proximal posthire outcomes such as initial job satisfaction (Wanous & Colella, 1989). Indeed, related research on realistic job previews (RJPs) indicates that RJPs have their strongest effects ($d = -.34$) on initial job expectations, which are typically measured soon after the RJP is administered (Premack & Wanous, 1985). In contrast, RJPs have much smaller effects on more distal criteria such as job survival ($d = .12$) and job performance ($d = .05$).

Conclusions

Empirical research investigating the differential information and applicant population difference hypotheses has important implications for how organizations should use recruitment sources in the selection process. The implicit assumption in the recruitment source literature has been that preference should be given to applicants from better recruitment sources when making selection decisions. For example, Ullman (1966, p. 35) stated, "If the average quality of workers recruited through employee referrals seems to be higher than the quality of workers from other sources, steps could be taken to increase the flow of applicants from this source, and to give preference to them." In practice, this advice would have lead the hospitals in our study to first offer jobs to rehires and employee referrals because their greater experience and prehire knowledge would have made them better performers and less likely to quit. However, this approach works only if prehire knowledge and experience completely mediate the relationship between recruitment sources and posthire outcomes such as performance and turnover. In fact, rehires and employee referrals were no better at their jobs than applicants obtained from other recruitment sources. Moreover, rehires and employee referrals had some of the highest rates of voluntary turnover, 33% and 40%, respectively.

Therefore, until research evidence supports fully mediated models of the differential information and applicant population difference hypotheses, organizations should not give selection preference to applicants from better recruitment sources. Regardless of the recruitment sources used to generate an applicant population, and regardless of the differences in applicants across recruitment sources, once a final applicant pool has been generated, organizations can maximize the payoff from their selection systems by ignoring recruitment sources and using a top–down, predictor-based selection strategy (Schmidt, Mack, & Hunter, 1984; Schmidt, 1988).

In fact, due to weak empirical support and the number of serious methodological problems associated with trying to establish a link between recruitment sources and posthire outcomes (i.e., pre-selection bias, applicant self-selection bias, posthire employer–employee interactions, and omitted variables; Alexander et al., 1983; Boudreau & Rynes, 1985; Mauro, 1990;

Barber, 1990), we believe it would be worthwhile to redirect the focus of recruitment source research toward prehire outcomes. Although scant research has been conducted, Boudreau & Rynes's (1985) utility model clearly demonstrates that even small changes in the level and variability of applicant qualifications, the number of applicants, and the rate of job acceptance can have large effects on the payoff that organizations derive from selection systems.

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