Nurse-physician collaboration: a meta-analytical investigation of survey scores.

Abstract

This meta-analysis investigated differences between nurses and physicians in interprofessional collaboration (IPC) ratings. Fifty-one surveys, representing a total of 18,782 professionals and students (13,132 nurses and nursing students, and 5,650 physicians and medical students), were meta-analyzed, considering several moderating variables. Overall, nurses scored higher on IPC than physicians. Sensitivity analysis revealed that while physicians perceived more existing collaboration than nurses, nurses had a more positive attitude toward collaboration than physicians. Moreover, IPC ratings of nursing and medical students did not differ from those of practitioners. Finally, it appeared that interprofessional education interventions were able to reduce the difference in IPC between nurses and physicians.

Introduction

Nurse-physician interprofessional collaboration (IPC) can be defined as the joint decision process in which nurses and physicians share objectives and responsibility of results. This process should be characterized by mutual trust, open communication, respect and knowledge about one's role and autonomy (Weiss & Davis, 1985). Physicians and nurses should work together in a non-hierarchical way, and should contribute equally to decisions regarding patient care (Taylor, 1996).

For two decades, nurse-physician collaboration has been advocated as an important strategy for improving both clinical care deliveries and organizational outcomes (WHO, 2010). Accordingly, good IPC has been shown to improve several aspects of the care process, such as quality of patient care, health outcomes (e.g., Baggs et al., 1999) and decreased mortality (Schraeder, Shelton, & Sager, 2001). Contrariwise, poor IPC negatively impacts patient outcomes and quality of delivered care (Callahan et al., 2006; Rosenstein & O'Daniel, 2005), which leads to a high level of dissatisfaction among professionals' (e.g., Lim, Bogossian, & Ahern, 2010), thus increasing the rates of resignation (Nelson, King, & Brodine, 2008) and turnover (Hughes & Fizpatrick, 2010).

Despite the fact that IPC is advantageous for professionals and patients, there are still several barriers to the effectiveness of nurse-physician collaboration (Rice et al., 2010). Several evidences demonstrate that nurses and physicians have a different understanding of collaboration (Kripalani et al., 2007), work together in a conflictual way (Robinson et al., 2010), and experience tense and even hostile relationships (e.g., Papathanassolgou et al., 2012). These barriers are rooted in historical differences between the roles of nurses and physicians, which traditionally are separated by status and power in hospitals (Schmalenberg & Kramer, 2009) as well as by educational and training program differences (Skjoshammer, 2001).

Other studies, however, demonstrate that the nurse-physician relationship is improving, becoming more collegial (Schmalenberg & Kramer, 2009) and characterized by mutual trust, respect, autonomy and participation regarding patient care (Tang, Chan, Zhou, & Liaw, 2013).

Some studies indicate that common interprofessional education programs (IPE) are one of the factors that can improve IPC, and that nurses and physicians are increasingly understanding the importance of working together for healthcare outcomes (Reeves, Perrier, Goldman, Freeth, & Zwarenstein, 2013).

In summary, notwithstanding some evidence of improved nurse-physician collaboration, differences between nurses and physicians still remain, and require further effort to enhance their professional relationship. Thus, knowing the extent to which nurses and physicians differ in their predisposition toward IPC is crucial to the process of improving IPC.

Objectives

The present meta-analysis aims to investigate the extent to which nurses and physicians differ in their ratings of IPC, and to evaluate potential moderators of any observed differences. The specific questions are:

1) Do nurses and physicians differ in their *attitude* toward IPC?
2) Do nurses and physicians differ in their *perception* of IPC?
3) What factors can moderate nurse-physician difference in IPC rating?

Before proceeding, questions 1 and 2 merit some clarifications. Several scales have been developed for measuring different dimensions of IPC that can, nevertheless, be assumed in the aforementioned general definition of IPC. However, in our opinion, these scales do not measure precisely the same thing, because some scales measure professionals' *attitude* toward IPC, asking professionals to express their agreement toward some statement related to IPC. Other scales measure the *perception* of existing IPC, asking practitioners to indicate the extent to which certain collaborative behaviors occur in their care units. Attitudes and perceptions influence each other (Eagly & Chaiken, 1993), but are very different psychosocial constructs, since attitudes refer to an expression of favor or disfavor toward a particular social object (in this case, IPC), thus reflecting the individual's desired aspect of the social context. Perceptions, instead, refer to individuals' experience of particular behaviors in a certain situation. Thus, perception pertains to the existing

situation, rather than the desired situation. Unfortunately, researchers tend to not state explicitly which kind of measure they use, and to overlap attitude and perception of IPC. According to Ødegård and Bjørkly (2012), the lack of clarity regarding the IPC measures developed and used (i.e., the IPC operationalization) could in part explain the motive for which "the meaning of IPC is somewhat inconclusive" (p. 284). For this reason, in this meta-analysis, the measure (attitudes vs. perception) was coded in order to control for the moderating effect.

The next sections follow the PRISMA statement for reporting systematic reviews and meta-analyses (Moher, Liberati, Tetzlaff, & Altman, 2009).

Method

Eligibility criteria

Reports were included if the following criteria were met: (a) published between 1999 and 2013, (b) quantitatively analyzed the nurse-physician collaboration, (c) included results from both nurses and physicians, (d) used a validated instrument to assess IPC, (e) reported sufficient statistics for computing effect size. Usually, meta-analyses are limited to English publications, and this has been advocated as a limit for systematic inquiries (Card, 2012). The present meta-analysis also considered articles in Italian, given that Italian is the first language of the authors.

Literature search

Search of studies comprised both scientific and gray literature. Computerized searches were conducted using Medline, CINAHL, SSCI, Psych INFO and PUBMED, using OVID and EBSCO software. For gray literature, Google and Google Scholar were used. Searching keywords were *collaboration*, *interdisciplinary*, *interprofessional*, *relations*, *nurses* and *physicians,* using Boolean operators AND and OR in several combinations of the search.

Study selection

Excluding duplicated records and those not in English or Italian, the search yielded a total of 890 records, which were screened for inclusion in the meta-analysis. Figure 1 shows the flowchart for inclusion/exclusion of records. This screening procedure left a total of 35 studies supplying 51

unique measures of IPC.

Figure 1 here

Data collection

Two authors (A.S. and L.C.) independently read all considered studies, coding several items (complete description of surveys available on request from the first author). In order to compute effect size, the mean, standard deviations and sample size of both nurses and physicians, as well as statistical tests of differences, were collected. When the total score[1] was not reported, weighted means and pooled standard deviations for both nurses and physicians were computed from disaggregated data.

Quality rating of surveys

Quality assessment is fundamental for the evaluation of consistency and validity of findings in each meta-analyzed survey. Given that studies were primarily correlational, it was impossible to apply standardized instruments to evaluate quality. Thus, a set of nine dichotomous (yes/no) *ad-hoc* indicators relevant to correlational designs were realized in accordance with Zangaro and Soeken (2007): 1) research questions are clearly stated, 2) participants in sample are described, 3) sub-samples of nurses and physicians are described, 4) the setting is described, 5) methods of data collection are described, 6) response rate is indicated, 7) operational definition of IPC is clearly stated, 8) instrument used to measure IPC are clearly indicated, and 9) internal consistency of the instruments are reported. A rating score was computed, summing the responses to questions 1-9. A total score lower or equal to 4 indicated poor quality, a score of 5 to 7 indicated medium quality, and a score of 8 to 9 indicated high quality.

Three judges (C.F., G.M., A.S.) independently evaluated each survey with an inter-rater agreement (Krippendorff's alpha, see Hayes & Krippendorff, 2007) ranging between 0.82 and 1, indicating strong agreement among judges. The few disagreements were discussed and a consensus

was quickly reached.

Data analysis

The mean difference between nurses' and physicians' IPC ratings was measured by Cohen's *d,* and negative values of *d* indicate a higher rating for nurses. The standardized mean difference, SDs and weights were corrected for small sample size bias (Lipsey & Wilson, 2001).

Given that meta-analyzed studies were very different in many aspects, the random effect model was chosen. Heterogeneity among studies was assessed with *I*-squared statistic, which represents the percentage of variance in meta-analysis that is attributable to heterogeneity.

Moderation with sub-group analysis (in case of categorical moderators), and meta-regression with restricted maximum likelihood estimation (in case of continuous moderators), were analyzed. For sub-group analysis, difference in effect size has been statistically tested by comparing *Q* for each sub-group (Lipsey & Wilson, 2001). This analysis compares between and within group heterogeneity, supplying statistical tests for the difference between levels of the moderator.

Finally, publication bias was assessed using both Begg's and Egger's tests.

Results

Characteristics of study samples

The total number of participants was 18,782. Thirty-nine out of 51 surveys concerned professional nurses (N = 7,898; 65.9%) and physicians (N = 4,084; 34.1%), for a total of 11,982 practitioners (63.8%). The remaining 12 surveys covered nursing (N = 5,234; 77.0%) and medicine (N = 1566; 23.0%) students for a total of 6,800 students (36.2%).

Mean age of the participants (number of studies k = 25) was 41.29 years (*SD* = 7.14), and average tenure (k = 18) was 16.99 years (*SD* = 9.69).

Characteristics of studies

Three studies were longitudinal and measured collaboration before and after an IPE. Other studies did not include a pre-test, but collected data after an IPE intervention. Surveys without (k = 36) or before (k = 3) an IPE intervention were coded in the same way ("single or pre-IPE," k = 39).

Surveys after an IPE intervention were coded as "post-IPE" (k = 12) regardless of whether they had a pre-IPE collection (k = 4) or not (k = 8).

Thirty-six surveys used scales measuring attitude toward IPC while 15 surveys measured perception of IPC. Forty-one surveys (80.4%) were from scientific literature, while ten surveys (19.6%) came from gray literature. Twenty-eight surveys (54.9%) were conducted in the U.S., 12 (23.5%) in Europe and the remaining 11(21.6%) in other countries. Only 25 surveys reported the facility: eleven (44.0%) were from an intensive care facility, 13 (52.0%) from an ordinary care facility and one (4.0%) from a community care facility.

Finally, 30 surveys (58.8%) were rated as medium quality, 20 (39.2%) were rated as high quality and only one was rated as poor quality (M = 7.10, SD = 1.28).

Pooled results

The overall effect size was significant (d = -.34, 95% C.I. = -.51 to -.17, Z = 3.93, p < .001), indicating a moderately higher rating for nurses (Figure 2).

No single survey influenced the overall result, given that overall d showed very little change (range = -37 to -.32) after omitting each survey in turn.

The overall effect, however, had great heterogeneity ($Q(50)$ = 1196.70, p < .001, I^2 = 95.8%), indicating effect size variability among surveys.

Figure 2 here

Sensitivity analysis

Results of moderation analysis are reported in Table 1. Type of measurement yielded different results ($Q(1)$ = 46.42, p < .001): when attitude was considered, a strong effect favoring nurses emerged (d = -.64, Z = 7.76, p < .001), while when perception was considered, a moderate effect favoring physicians appeared (d = .45, Z = 3.44, p = .001).

Scores for students versus professionals showed no significant difference ($Q(1)$ = .04, p =

.84), because both students (d = -.32, Z = 2.52, p = .01) and professionals (d = -.35, Z = 3.12, p = .002) showed moderated effects favoring nurses or nursing students.

The type of design revealed no significant difference ($Q(1)$ = 3.36, p = .07), although studies with unique measure, or pre-IPE intervention showed a higher score for nurses (d = -.43, Z = 4.00, p < .001), while studies realized after an IPE intervention evidenced no differences between professions (d = -.06, Z = .44, p = .66).

Facility significantly moderated the difference between nurses and physicians ($Q(1)$ = 4.00, p = .045), showing that, in ordinary care units, nurses tended to have a higher mean than physicians (d = -.42, Z = 1.86, p = .06), while the opposite tended to occur in ICU (d = .23, Z = 1.00, p = .32).

Country did not significantly moderate the difference between nurses and physicians ($Q(2)$ = 1.01, p = .60).

Also, publication type was not significant ($Q(1)$ = .04, p = .84) as surveys from both scientific (d = -.33, Z = 3.51, p < .001) and gray literature (d = -.37, Z = 1.63, p = .10) showed effects favoring nurses over physicians.

Finally, meta-regression showed no significant effect of quality ratings (b = .11, SE = .08, t = 1.32, p = .19), but a significant effect of publication year (b = .06, SE = .03, t = 2.28, p = .02), indicating that difference between nurses and physicians regarding IPC has reduced in recent years.

Table 1 here

Further analysis

The specific scales measuring IPC deserve further attention. Thus, a sensitive analysis considering the scale was conducted (Table 2).

Only CSACDS and NPCS yielded no significant differences between nurses and physicians. However, analysis of the influence of a single survey revealed that by excluding one survey (Nair et al., 2012), the pooled effect of NPCS was significant (d = .53, Z = 3.52, p < .001, 95% CI = .23 to .82).

Table 2 here

Publication bias

Begg's and Egger's tests indicated no publication bias (Begg's test: $Z = 1.50$, $p = .13$; Egger's test: 1.20, $t = .84$, $p = .40$).

Discussion

This is one of the first meta-analyses on differences in nurse-physician ratings of IPC, and factors which moderate these differences.

Results indicated that overall, nurses showed a greater predisposition towards IPC than did physicians, independently by the country in which they worked. This finding, albeit of moderate intensity, indicates that physicians would be somewhat reluctant to engage in an effective collaborative practice (e.g., Makary, Sexton, Freischlag, Holzmueller, & Millman, 2006).

Meta-analysis also showed considerable variability in the differences between physicians and nurses across studies. A powerful moderator was the considered measure of IPC. Indeed, if scales measuring IPC attitude were considered, a systematic and strong effect favoring nurses emerged, indicating that nurses hold more positive attitudes toward IPC than do physicians. Contrariwise, considering scales measuring IPC perception, physicians perceived more existing collaboration than did nurses. This evidence suggests that nurses and physicians have a different understanding of what collaboration is, and recognize IPC to different extents (Lingard et al., 2012; Makary et al., 2006). Indeed, on one hand, nurses seem to ask for more collaboration (e.g., more professional autonomy, or "emancipation" in Haddara & Lingard's (2013) terms), while on the other hand, physicians seem to affirm that a good collaboration already exists. Given that attitudes and perceptions about IPC refer to two different aspects of the work environment (desired vs. interpretation of the existing context), the difference between nurses and physicians indicates not simply a difference between professionals, but rather a different understanding of the job context,

and different interest implied in the IPC.

These results also raise some important concerns with respect to the use of instruments to measure IPC. Analysis suggests that researchers should be well aware of the conceptual definition of IPC they are considering, and cautious when they choose the instrument to measure nurse-physician collaboration. Indeed, different kinds of measures may supply biased results favoring either nurses or physicians (see also Ødegård & Bjørkly, 2012).

Another moderator was IPE intervention. Studies collecting data after an IPE intervention indicated no difference between nurses and physicians regarding IPC, while studies collecting data first or without an IPE showed an effect favoring nurses over physicians. This suggests that interdisciplinary trainings can effectively improve interprofessional skills and cooperative behavior, especially for physicians. However, the difference between studies with and without IPE was not statistically significant. This imposes caution about the strength of the positive effect of interdisciplinary training, and confirms the urgent need to implement strategies for improving collaborative work (Mann et al., 2009).

Also, facility type appeared to significantly affect IPC between nurses and physicians. Results show that in ordinary wards, nurses have higher scores than physicians, while in ICUs, physicians showed a higher score. This seems to strengthen the idea that work organization of ICUs could be used as a lesson for improving IPC in other areas of care (Stein-Parbury & Liaschenko, 2007).

An important, and somewhat surprising, result is that both practitioners and students showed the same pattern, that is, nurses and nursing students have higher scores in IPC than do physicians and medical students. Given the strong emphasis on common education in healthcare, raised in the last decade, this result seems to indicate that further work is needed to train students to go beyond the confines of their own discipline (e.g., Abbot, Watson, & Townsley, 2005). This seems to be more urgent for medical students, who are still trained to be independent and autonomous (Atwal & Caldwell, 2005).

A final observation regards the significant decrease of nurse-physician difference in IPC in the

last years. Although substantial work is needed to overcome the remaining barriers to collaboration, the reduction of differences in attitude and behavior linked to nurse-physician collaboration may be due to strong efforts made by healthcare organizations, in order to enhance professionals' awareness of the importance of IPC for improving the quality of patient care. This indicates that organizations are effectively answering the principal challenges for healthcare industries, which, nowadays, are organizational rather than clinical (Ramanujam & Rousseau, 2006).

Limits

This meta-analysis has several limitations. Firstly, despite an attempt to consider the gray literature and not limit the analysis to English papers, studies in other languages were omitted. However, the relatively wide geographical provenience of surveys permits some optimism regarding the generalizability of results. Another limitation concerns the fact that in moderation analysis, some surveys were not actually independent. This may affect in particular the estimation of the IPE effect. However, the small number of longitudinal surveys (3 over 51), seems to restrict this threat. A further limitation is the use of the total score of each scale instead of the score of each sub-dimension. This may obscure the differences between nurses and physicians on particular aspects of IPC. However, this choice was necessary for comparing ratings of both groups of professionals. Moreover, although scales may be composed of several subscales, they normally refer to one main, general construct of IPC. This increases the possibility of comparing overall scores of different scales. Finally, further moderation analyses on each scale or kind of measure would be addressed in future work.

Conclusion

The most significant implication of this study concerns the difference in the understanding and meaning of collaboration between nurses and physicians. Given that healthcare organizations are spending considerable money in order to improve IPC, it is crucial to be aware that nurses and physicians view collaboration in a different way. This, in turn, is reflected in the choice of the instrument used to measure IPC.

Declaration of Interest

The authors report no conflicts of interest.

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Footnotes

[1] Several scales have more than one factor. However, in this meta-analysis, the total score was considered in order to compare differences between nurses and physicians on a global assessment of IPC. Only 5 studies did not report an overall score.

Table 1. Sensitivity analysis for considered moderators

		Q between	k	*d*	95% C.I.	*Q* within
Type of measure		46.42**				703.28
	Attitude		36	-.64**	-.80 to -.48	617.10
	Perception		15	.45**	.19 to .70	86.18
Sample		.04				1191.61
	Students		12	-.32*	-.58 to -.07	168.04
	Professionals		39	-.35**	-.57 to -.13	1023.57
Design		3.36				1173.62
	Unique or Pre IPE		39	-.43**	-.64 to -.22	974.58
	Post IPE		12	-.06	-.35 to .22	199.03
Facility type		4.00*				646.07
	Intensive care		11	.23	-.22 to .69	248.21
	Ordinary care		13	-.42^	-.86 to .02	397.86
Country		1.01				1086.29
	Europe		12	-.50*	-.92 to -.08	310.48
	USA		28	-.30**	-.52 to -.08	483.01
	Other		11	-.28	-.64 to .07	292.80
Publication		.04				1164.90
	Scientific		41	-.33**	-.52 to -.15	987.03
	Gray		10	-.37	-.81 to .07	177.87

^ $p = .06$; *$p < .05$, ** $p < .01$

Table 2. Sensitivity analysis for scales measuring IPC.

	Q between	k	*d*	95% C.I.	*Q* within
Scale	54.71**				589.62
Perception					
CPS		4	.87**	.64 to 1.11	1.60
CSACDS		3	.20	-.69 to 1.09	8.48
ICU NPQ		2	.47**	.13 to .80	0.58
NPCS		5	.23	-.25 to .72	55.81
Attitude					
IHCT		3	-.20**	-.29 to -.11	1.53
JSAPNC		29	-.68**	-.88 to -.48	514.13
RIPLS		4	-.70**	-.84 to -.55	7.48

** $p < .01$

CPS = Collaboration Practice Scale, CSACDS = Collaboration and Satisfaction About Care Decision Scale, ICU NPQ = ICU Nurse-Physician Questionnaire, IHCT = Interprofessional HealthCare Teams; JSAPNC = Jefferson Scale of Attitude towards Physician-Nurse Collaboration, NPCS = Nurse-Physician Collaboration Scale, RIPLS = Readiness for Interprofessional Learning Scale

Figure 1. Flowchart for records inclusion/exclusion

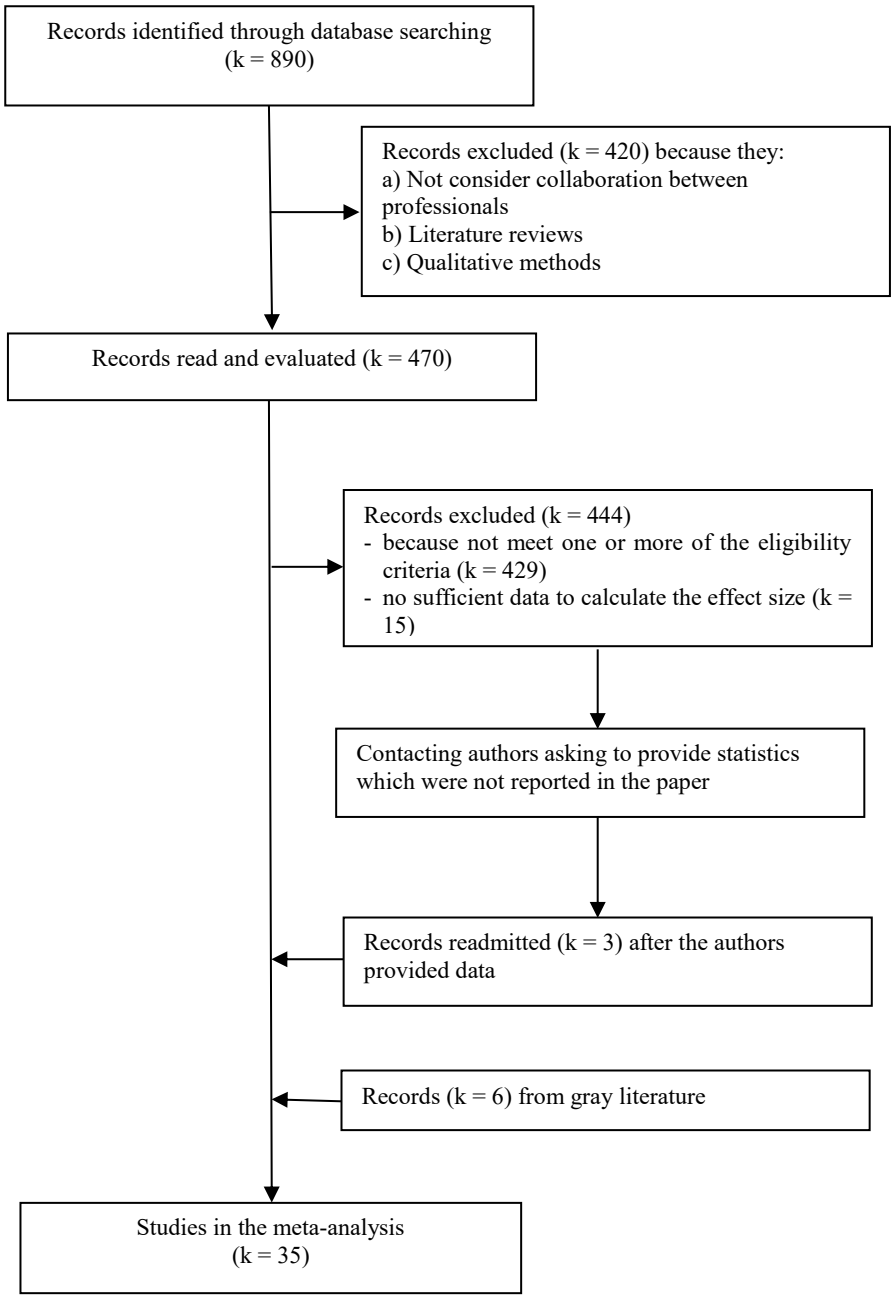

Figure 2. Effect size, variance and forest plot of the analyzed surveys

Survey	*d* adj	Variance adj
Hojat et al.,1999	-.68	.017
Hojat et al., 2001(1)	-1.56	.026
Hojat et al., 2001(2)	-.60	.011
Cicchetti et al., 2002	-1.48	.015
Hojat et al., 2003(1)	-1.18	.004
Hojat et al., 2003(2)	-1.18	.010
Hind et al., 2003	-.62	.017
Yildirim et al., 2005	-.45	.003
Yildirim et al., 2006	-.51	.028
Sterchi et al., 2007	-.89	.032
Gillen, 2007	-1.15	.047
Refatti & Bevilacqua, 2007	-1.63	.178
Hamric et al., 2007	.64	.041
Jones & Fitzpatrick, 2009	-1.63	.026
Pevida, 2009	-.80	.007
Taylor, 2009	-1.56	.022
Dillon et al., 2009(2)	.15	.146
Pomari, 2009	-.05	.020
Garber et al., 2009	-.30	.015
Dillon et al., 2009(1)	-.36	.083
Hansson et al., 2010	-.57	.010
Curran et al., 2010(4)	-.88	.007
Curran et al., 2010(5)	-.67	.007
Ardahan et al., 2010	.77	.015
Curran et al., 2010(1)	-.28	.006
Curran et al., 2010(6)	-.58	.008
Curran et al., 2010(3)	-.15	.007
Curran et al., 2010(2)	-.16	.007
Hughes & Fitzpatrick, 2010	-.57	.028
El Sayed & Sleem, 2011	-.74	.039
Yosedirm et al., 2011	-.32	.011
McCaffrey et al., 2012(1)	-.41	.036
McCaffrey et al., 2012(2)	-.11	.036
Caricati et al., 2013b(1)	-.73	.037
Caricati et al., 2013b(3)	-1.15	.020
Caricati et al., 2013b(2)	-.58	.079
Miller, 2001	.59	.053
Tschannen, 2004	.33	.064
Russel et al., 2006(2)	-.01	.325
Russel et al., 2006(1)	-.40	.144
Nelson et al., 2008	.76	.033
Ushiro, 2009	.30	.003
Donald et al., 2009	.19	.114
Nair et al., 2012	-1.01	.043
Gerard, 2011(2)	.88	.076
Nathansonn et al., 2011	.86	.059
Gerard, 2011(1)	.84	.075
Gerard, 2011(3)	1.18	.081
Caricati et al., 2013a(1)	.30	.077
Caricati et al., 2013a(3)	.59	.018
Caricati et al., 2013a(2)	.95	.038
Total	-.34	.008