

Audit Committee Evaluation in South Africa's Public Sector: The 360-Degree Approach

KN Motubatse

Tshwane University of Technology, South Africa

Abstract: Although the desire and need to assess audit committees' effectiveness is a growing phenomenon, there is no single way of evaluating their performance, or to determine if the execution of their mandates is more/less effective in the public/private sector. The problem is that audit committees have traditionally been assessed according to a single set of measurements based on members' qualifications and experience, while ignoring the importance of processes and variables emerging from a 360-degree evaluation. The purpose of this paper is to determine the effectiveness of audit committee self-evaluation in the South African public sector when the 360-degree approach is used. This paper draws its understanding of the 360-degree evaluation method's effectiveness from the literature and qualitative methods reviewed. A semi-structured interview was conducted with individual directors of internal audit and members of their audit committees to obtain their expert opinions. Both convenience and snowball sampling methods were used to select the participants. Participants were drawn from the nine Provincial Treasuries and from their audit committees in the public sector. The paper finds that the 360-degree evaluation method is not being used by the audit committees of provincial entities as a self-assessment tool, and neither is its use elsewhere fully compliant with National Treasury's requirements. The results further indicate that the governance structures, management and internal auditors of these entities are not using the 360-degree evaluation tool to its full potential when assessing the audit committee's effectiveness. Therefore, this paper proposes that the National Treasury makes greater effort to promote the implementation of the 360-degree evaluation approach to audit committee performance, one that recognises the unique characteristics of public sector audit committees and their stakeholders.

Keywords: 360-degree evaluations, Audit committees, Effectiveness, Public sector, Self-evaluation

1. Introduction

Audit committee evaluation using the 360-degree methodology in the South African public sector is highly effective and the tool is appropriate for helping the audit committee members to understand their strengths and weaknesses in the performance of their official responsibilities. Much of the successes in the evaluation of the audit committees is as a result of effective implementation of the process. However, implementation has not been uniformly achieved despite this being an official directive from the National Treasury (National Treasury, Online). Since the commencement of 360-degree evaluations of ACs in the public sector, the evaluation criteria have not been subject to the refinements and updates one would expect of an intensive, practical tool that is required to generate reports to be included in the entities' annual reports (these reports are expected to show the audit committees' self-assessments and their assessments by their stakeholders.) Thus, this present study seeks the views of both AC members and the directors of internal audit functions in the public sector in order to provide an up-to-date understanding of the ACs'

360-degree evaluation process. The discussion was guided by five (5) questions the researcher deemed essential to achieving an understanding of the effective implementation of the 360-degree evaluation methodology. The questions were:

- What is the overall purpose of the 360-degree evaluation of audit committees tasked with oversight of public sector governance;
- Are the audit committees aware of the requirement to perform 360-degree evaluations;
- What are the challenges to the effective implementation of the 360-degree evaluation process in the public sector;
- Do you think the 360-degree evaluation process can improve the audit committee's effectiveness; and
- Do you think the total non-performance of 360-degree evaluations of audit committees might lead to internal control deficiencies?

According to Carless *et al.* (1998:482), the performance of a 360-degree evaluation helps the assessment of individual job performances where the underlying purpose is to achieve sustained improvement. Thus, the effective performance of 360-degree evaluations of audit committees is essential for the effective functioning of audit committees in the public sector. These evaluations offer significant opportunities to audit committees (both as an entity and to its individual members) to find out how they are performing, how they interact with each other, with management, internal audit, external audit and with other stakeholders, and how effective they are when interrogating audit reports and the reports of other assurance providers. Although this research was intended to determine the effectiveness of the audit committee self-evaluation processes in the South African public sector (using the 360-degree approach), by discovering the views of the members of the audit committees, the entities' management and their assurance providers, this became problematic as many interviewees are still unclear as to what this approach is, and just as unsure as to how it can be used effectively. Thus, it can be argued that many public sector departments are probably not taking advantage of the insights a 360-degree evaluation of their audit committees could provide, and as a result, this tool is not being used effectively to improve audit committee performance and functioning in governance. Lepsinger and Lucia (2009:6) state that the 360-degree evaluation is synonymous with multi-source feedback. Fleenor and Prince (1997) observe that the benefits of 360-degree evaluations include that they create a better picture of how an individual is performing in predetermined competency areas. When professionally and sensitively implemented, it is regarded as a reliable tool to assess feedback from multiple sources (Conine & Leskin, 2016). Despite the fact that the 360-degree evaluation of audit committees is mandated and supported by the National Treasury (2009), (as the custodian of public sector audit committees) the tool is still underused. For example, Chopra (2017) identifies some challenges to the implementation of 360-degree evaluations, including a lack of knowledge and a failure to understand the benefits arising from the use of the tool. When it is used, the feedback solicited and received from every person affected by the performance and activities of the process (Chopra, 2017) is superficial and apparently generated without much depth of thought or analysis.

Formal audit committee evaluation is often seen as an effective means of assessing the quality of audit committees' activities and competencies. The rationale behind the use of the 360-degree approach is that the collective feedback from various stakeholders (including management, internal audit and the audit committee itself), can be more effectively used to demand accountability from providers of assurance oversight. As an aside, at present there is no officially sanctioned alternative method by which to gain an insight into how audit committees are performing and whether they are adding value to the South African public sector entities they serve. Therefore, the objective of this study is to determine the effectiveness of the audit committee self-evaluation process in the South African public sector using the 360-degree approach. In pursuit of this objective, semi-structured interviews were conducted with directors of internal audit and members of the audit committees in selected public sector entities, to obtain their expert opinion. This paper is structured as follows: The next section provides a background understanding of the 360-degree evaluation process, and discusses the relevant literature. Section 3 describes the data collection process and the research method. In section 4, the data emerging from the interviews is analysed. Finally, section 5 offers conclusions drawn from the analysis of the data.

2. Literature Review

According to Lepsinger and Lucia (2009), the history of 360-degree feedback begins in the early 1950s, where it was used by the German military to gather feedback from multiple sources in order to evaluate officers' performance during World War II. The growing popularity of 360-degree feedback gained momentum to the extent that it is now routinely used to obtain feedback to determine competence levels (Liang *et al.*, 2017) and to assess performance improvement (Campion *et al.*, 2015). Thus, organisations and professional associations rapidly came to understand and embrace the concept as a performance measurement tool (Humphrey, 2017). From a management point of view, giving feedback is not an unusual exercise or a new practice (McCombs, 2014). The objective of the 360-degree evaluation (in South Africa's public sector entities) is to gain insight into how audit committees fulfil their oversight roles with respect to the public financial reporting process, and the internal control systems, internal audit

function, business risk areas, and compliance with laws and regulatory provisions. This paper thus investigates the effectiveness of audit committees' use of the 360-degree feedback approach. While National Treasury requires that the effectiveness of the audit committees be evaluated (National Treasury, 2009), using the 360-degree approach, the question remains inconclusively answered as to whether their use of this approach generates an accurate reflection of the actual situation, and whether the information about the audit committee's independence and understanding of business risks is accurate. Of course, the audit committee's mandate is prescribed in the entity's audit charter, and any evaluation is likely to contain a subjective element. Thus, it is difficult to compare the individual perceptions of the audit committee's overall performance, and generate a cohesive view that can be measured against the audit charter. Hence, as is argued in this paper, at any given level of collective evaluation, there is a likelihood that the individual evaluations will range from significantly less-than-satisfied through to ecstatically satisfied with performance. The purpose of an audit committee assessment is to provide audit committee members with insight into the effectiveness of the audit committee as a collective, and themselves individually, and thus to identify areas in need of improvement (Deloitte, 2013). According to Treasury, this assessment must occur annually. The assessment instruction must set out a clear set of objectives and key performance indicators for the audit committees in respect of their responsibilities (National Treasury, Online). In South Africa, King II recommends that the board should regularly review and assess its own effectiveness by means of a self-assessment. This self-assessment should be of the board as a whole, and each of its committees, and the contributions of each individual director (IOD, 2002). Thus, in similar vein, the work of the audit committee should be evaluated by the audit committee itself, the accounting officer, the external auditors and the internal auditors (National Treasury, Online).

The 360-degree evaluation of audit committees has not been widely welcomed across public sector organisations: despite this resistance there is increasing demand that governance structures should be evaluated. Little has been described in the literature about the relative importance (or effectiveness) of doing the 360-degree evaluations of

audit committees in the South African public sector. In addition, and adding significantly to the challenges of implementing the 360-degree evaluation process in the public sector, is the fact that there is a notable lack of compliance monitoring tools emanating from National Treasury. Thus, this paper is necessarily based on the premise that 360-degree evaluations of audit committees can be focused on assessing their technical competencies and leadership skills. This premise notwithstanding, the fact is that the audit committee composition, its collective and individual understanding of business risks, processes and procedures in the areas of risk management, internal control, financial reporting and governance can also be subject to improvement by including them in the 360-degree assessment, and this would thus create an enhanced self-awareness of the performance of the activities of the audit committees in the public sector. See Table 1 on the following page.

ACs in the public sector environment are expected to use the 360-degree assessment feedback and evaluation in order to get a better understanding of their strengths and weaknesses. Such feedback provides them with useful results in the areas where they are under-performing.

3. Research Methods

Qualitative research is a research methodology that analyses information gathered through the study of language and behaviour in natural settings (Berkwits & Inui, 1998). Hence, qualitative research is often used in situations where new ideas are developing (Creswell & Poth, 2017). In the present study, the qualitative research approach was used to capture information about opinions and motivations that underlie the participants' perceptions of the audit committee members and the directors of their internal audit functions. In following a qualitative research method to dive deeper into the research problem, this study used a semi-structured interview format, conducted with two audit committee members and two directors of internal audit functions at two unrelated government entities. The interviews were conducted at the National Treasury's offices in Pretoria. Semi-structure interviews can provide reliable and comparable qualitative data (Creswell & Poth, 2017) which means that the data collected can be subjected to a certain amount of statistical analysis. With this in mind, the researcher contacted the research participants to personally invite them to

Table 1: 360-Degree Assessment

Evaluation Area:	
Composition and Quality	According to Wang <i>et al.</i> , (2016), audit committee composition should include someone with financial and accounting expertise whose specialist skills can prevent managers from manipulating accounting estimates or applying inappropriate accounting methods, thereby minimising the risk of material misstatement in financial statements. For example, when Kim <i>et al.</i> , (2016) examined the impact of changes in audit committee attributes on financial expertise, size, and independence on firms' audit inputs and financial reporting quality and found that more independent, and more competent audit committees are better able to detect misstatements and/or deter opportunistic reporting by management, independent of the audit quality.
Introspection	Be introspective (AICPA, 2009). Evaluate the audit committee's performance by asking specific questions about the impact it has had on the organization, and most importantly, its financial reporting process, the annual audit, the relationship with the internal and independent auditors, members of management and elected officials (AICPA, 2009).
Understanding Business and Risks	Auditors should assist the ACs to understand their responsibilities and to follow best practices (McMullen & Raghunandan, 1996).
Comprehensive	Conduct 360-degree evaluations of all audit committee members and the committee chair. The chair should consider the result of the audit committee members' evaluations of each other in the context of the chair's evaluation of the members (Limpopo Provincial Treasury, 2015/16). The chair should consider whether any members of the committee should be rotated off the committee; this should be done in consultation with the representative of the governing body or the equivalent official. The members' attendance record and level of participation should be considered during this process (AICPA, 2009).
Oversight of Internal and External auditors	Dobija (2015) asserts that an AC is an effective tool of oversight for financial reporting and external auditors.
Performance improvement	Ask the chief audit executive, chief financial officer, chief executive officer, and independent auditor for comments on the performance of the audit committee (AICPA, 2009).
Process and Procedure	The audit committee chairperson should be considered a key actor in the AC process and procedures with respect to the contribution, power and influence over the role of the audit committee (Compernelle & Richard, 2017).
Competency	Lisic <i>et al.</i> , (2016) suggest that a more independent and expert audit committee is needed. Therefore, audit committees should be evaluated on the baseline of competency and performance (Bolton, 2014).
Communication	Audit committee should have direct communication channels with auditors (Scarborough, <i>et al.</i> , 1998). Thus, the establishment of the audit committee is to ensure continuous communication between external auditors and internal auditors, where the committee meets regularly with the auditors to review financial statements and audit processes.
Leadership	The members should talk about the performance of the committee chair. If the members collectively agree that the committee chair is not performing at the level needed, the members should bring their concerns to the attention of the chair of the governing body or equivalent official (AICPA (2009); Limpopo Provincial Treasury (2015/16).

Source: AICPA (2009); Limpopo Provincial Treasury (2015/16)

participate in the study. The standard pre-research interview protocols were followed by the researcher during which the nature and scope of the research were discussed with the participants. The questionnaire comprised five (5) questions. The interviews lasted approximately 35 minutes, were conducted in English, and were subsequently transcribed by the researcher.

4. Findings and Discussion

This section presents the research findings that emerged from the analysis of the interviews. Participants were requested to provide their opinions on the use of the 360-degree evaluation process on their audit committees, all of which function in the South African public sector.

4.1 Overall Purpose of the 360-Degree Evaluation Process on Audit Committees in the Public Sector Governance

According to participant 1:

"The overall purpose of the 360 degree evaluation is to establish the level of the following: independence of the AC and correct capacitation; understanding the business of the entity the AC oversees; performance of AC in general; and AC execution of its mandate as per paragraph 3.1.10 of the Treasury Regulations".

In their study of 360-degree assessment of management competency, Liang *et al.* (2017), discover that the 360-degree competency assessments could be used to identify the strengths and weaknesses of service providers at an individual level, team level and organisational level. Hence, the above measurements set forth by the AICPA (2009) are aligned to the findings presented by Liang *et al.* (2017).

4.2 Audit Committees' Awareness of 360-Degree Evaluations

Participants 2 and 3 had this to say:

"AC's are well aware of the 360 evaluations; the challenge might be the ability to interpret the outcomes of the evaluations and to implement corrective action where shortcomings are identified. In cases where they are not aware, management is to be blamed as they should have introduced the tool to AC as management is also required to perform the assessment".

This view corresponds with that of Rao and Rao (2014), who state that the effective use of 360-degree evaluation requires the right attitude. This implies that the 360-degree process' feedback will only help those who want to make constructive use of the information, be they an individual audit committee member or a group/committee as a whole. With the right attitude this evaluation process helps them to recognise their strengths and the areas needing improvement while also enhancing general awareness through this communication process. Effectively, an awareness of the reasons for and administrative processes driving the assessment will enable the audit committee to understand any new areas identified in the process, thus enabling them to make meaningful changes.

4.3 Challenges to Effective Implementation of the 360-Degree Evaluation System in the Public Sector

Participant 3 said the following:

"The biggest challenge identified is the understanding of the tool. Currently in a shared AC structure like Limpopo, on one item you will find different answers to a question, which is odd as the charter and structure for the entire clusters is one [i.e. there is a single charter for the entire cluster of departments]. Further to that is [that] members of AC don't take time to familiarise themselves with the business of the departments. Of course, in my view, [the provision of] workshop or induction could assist here. Non-performance in terms of paragraph 3(c) [of the Treasury Regulations], also leads to inconsistent reporting on the tool".

As demand continues to grow for improvements in effective governance (and despite the fact stated above that audit committees "do not take time to familiarise themselves with the business of the department", Vukotich (2014:30) states that the most common "mistakes and misuses of 360 feedback are often made in its implementation and use". However, Humphrey (2017) maintains that the 360-degree feedback process is one of the assessments used to foster leadership capability. Thus, the effective implementation of a 360-degree feedback system can be seen and used as a strategy to improve effective governance and improve efforts to achieve the entity's goals.

What would the positive outcomes be if the 360-degree evaluation process were successfully implemented? It is axiomatic that feedback is essential if the performance of the audit committee is to improve. Thus, the results of a 360-degree assessment, if offered and received sincerely, provide extra impetus to the process of improvement. Hence, within the context of the audit committee evaluation, 360-degree feedback could be used to obtain and assess performance information on the chairperson of the audit committee and on that of individual member. Regarding feedback performance, Rasheed *et al.* (2015) indicate the existence of direct associations between feedback use, accountability, self-efficacy and social awareness and performance, as well as indirect relationships manifesting as satisfaction with the feedback.

Hence, as Participant 4 asserts:

"Before the tool is implemented, AC members, internal audit and management should be taken through all the aspects of the tool – meaning [they should be shown] what is expected of them to do with the evaluation".

While Participant 5 recognises that:

"this is evident from inputs received from the stakeholders as in [in] certain situations, their inputs differ significantly."

Hence, as Participant 1 confirms:

"the tool can also be utilised to define the objectives or focus areas of the AC during the year. For example, that kind of effort can direct the department to achieving positive audit opinion".

4.4 The Ability of the 360-Degree Evaluation to Improve the Audit Committee's Effectiveness

In response to this question, Participant 4 said:

"Yes, it can, if proper care is taken from the onset, when it is introduced, and further if it is utilised to inform the annual work schedule of AC".

Audit committee effectiveness is evaluated in terms of demonstrated independence (Sun *et al.*, 2014), and other key characteristic such as financial expertise and an understanding of financial controls (Lisic *et al.*, 2016). Hegazy and Stafford (2016) point out that there is a developing understanding and growing competence within the AC in terms of their assurance which can only improve as the roles and responsibilities of the audit committee are sympathetically evaluated in terms of the audit committee's charter (National Treasury, 2009)

4.5 The Ability of [The Absence] of 360-Degree Evaluation of Audit Committees to Lead to Internal Control Deficiencies.

Finally, Participant 3 asserted:

"Not really, as paragraph 3.1.10 of the Treasury Regulations is also in place to mitigate the non-availability of the tool".

Participant 1 shared a similar view, affirming that:

"taking into account that the AG also conduct quarterly key control exercises, the risk is manageable".

According to Alzeban and Sawan (2015), the AC is charged with the responsibility of reviewing public sector financial information and with facilitating the work of both the internal audit function and the external auditors. It does so by monitoring the work performed by the internal auditors with respect to compliance with rules and regulations, and that performed by the external auditors on financial controls and reporting.

5. Conclusion and Recommendations

A significant body of research literature has emerged in recent years, in which the various aspects of the 360-degree evaluation process have been investigated, but there are still notable gaps. Thus, a better understanding of the 360-degree evaluation processes as an underlying aspect of what makes an AC effective will see the tool itself improve and thus participate in improving the efficacy of the AC in the public sector. Based on the semi-structured interviews conducted to address this study's problem statement, it can be concluded that the participating internal audit directors view the use of 360-degree evaluation as an effective tool to improve the performance of the audit committees in the public sector environment. This paper has also identified difficulties in the implementation of the evaluation process. The key difficulties are the failure to implement the evaluation process and, where it is used, there is inconsistency in the organisation's compliance with Treasury's protocols on the use of 360-degree evaluations of the audit committees in the South African public sector. The 360-degree evaluation of audit committees was first recommended in the King II Report on corporate governance in 2002, and subsequently adopted by the South African National Treasury to enhance the effectiveness of audit committees in the public sector. Now, some sixteen years later, it should be actively promoted to enable the audit committees in the public sector to identify, understand and enhance their strengths and to address their weaknesses more effectively.

References

- AICPA. 2009. Self-Evaluation: A Primer for Audit Committees. Available at: <http://www.aicpa.org/ForThePublic/AuditCommitteeEffectiveness/AuditCommitteeBrief/DownloadableDocuments/Self%20Evaluation.pdf>. Accessed on 28 December 2017.
- Alzeban, A. & Sawan, N. 2015. The impact of audit committee characteristics on the implementation of internal audit recommendations. *Journal of International Accounting, Auditing and Taxation*, (24):61-71.

- Berkwits, M. & Inui, T.S. 1998. Making use of qualitative research techniques. *Journal of General Internal Medicine*, 13(3):195-199.
- Bolton, B. (2014). Audit committee performance: ownership vs. independence – Did SOX get it wrong? *Accounting & Finance*, 54(1):83-112.
- Campion, M.C., Campion, E.D. & Campion, M.A. 2015. Improvements in performance management through the use of 360 feedback. *Industrial and Organizational Psychology*, 8(1):85-93.
- Carless, S.A., Mann, L. & Wearing, A.J. 1998. Leadership, managerial performance and 360-degree feedback. *Applied Psychology*, 47(4):481-496.
- Chopra, R. 2017. 360 Degree Performance Assessments: An Overview. *Global Journal of Enterprise Information System*, 9(3):102-105.
- Compernelle, T. & Richard, C. 2017. The Audit Committee as an Interactive Process: Insights on the AC Chairperson's Power. *European Accounting Review*, 1-25.
- Conine, T.E. & Leskin, B. 2016. Developing Emotional Intelligence and Conflict Management Skills Through the 360 Assessment. *Global Business and Organizational Excellence*, 35(3):18-26.
- Creswell, J.W. & Poth, C.N. 2017. *Qualitative inquiry and research design: Choosing among five approaches*. Sage Publications.
- Deloitte. 2013. Audit Committee Brief. Available at: <https://www2.deloitte.com/content/dam/Deloitte/us/Documents/center-for-corporate-governance/us-aers-acbrief-february2013-3262015.pdf>. Accessed on 28 December 2017.
- Dobija, D. 2015. Exploring audit committee practices: oversight of financial reporting and external auditors in Poland. *Journal of Management & Governance*, 19(1):113-143.
- Fleenor, J.W. & Prince, J.M. 1997. Using 360-degree feedback in organizations. Greensboro: Center for Creative Leadership
- Hegazy, K. & Stafford, A. 2016. Audit Committee roles and responsibilities in two English public sector settings. *Managerial Auditing Journal*, 31(8/9):848-870.
- Humphrey, D.V. 2017. *360-degree feedback impact on leadership development: A multiple case study*. Unpublished Doctoral thesis. Capella: Capella University.
- Institute of Directors. 2002. *King report on corporate governance for South Africa*. Johannesburg: Institute of Directors. Available at: <http://www.iodsa.co.za/PRODUCTSSERVICES/KingReportonGovernanceinSA/KingII.aspx>. Accessed on 9 July 2017.
- Kim, J.B., Segal, B., Segal, D. & Zang, Y. 2016. The Triangular Relationship Between Audit Committee Characteristics, Audit Inputs, and Financial Reporting Quality. 2014 Canadian Academic Accounting Association (CAAA) Annual Conference. Available at: SSRN: <https://ssrn.com/abstract=2373341> or <http://dx.doi.org/10.2139/ssrn.2373341>.
- Lepsinger, R. & Lucia, A.D. 2009. *The art and science of 360 degree feedback*. London: John Wiley & Sons.
- Liang, Z., Howard, P.F. & Leggat, S.G. 2017. 360° management competency assessment: Is our understanding adequate? *Asia Pacific Journal of Human Resources*, 55(2):213-233.
- Limpopo Provincial Treasury. 2015/16. Audit committee 360 degree evaluation report. Polokwane: Limpopo Provincial Treasury.
- Lisic, L.L., Neal, T.L., Zhang, I.X. & Zhang, Y. 2016. CEO power, internal control quality, and audit committee effectiveness in substance versus in form. *Contemporary Accounting Research*, 33(3):1199-1237.
- McCombs, B.L. 2014. Using a 360 degree assessment model to support learning to learn. R., Deakin-Crick, T., Small, C. Stringher, (Eds.). *Learning to learn for all: Theory, practice and international research: A multidisciplinary and lifelong perspective*, 241-270.
- McMullen, D.A. & Raghunandan, K. 1996. Enhancing audit committee effectiveness. *Journal of Accountancy*, 182(2):79.
- National Treasury. Guidelines for the Audit Committee. Available at: <https://oag.treasury.gov.za/RMF/Pages/s302AuditCommittee.aspx>. Accessed on 23 December 2017.
- National Treasury. 2009. *Internal Audit Framework*. 2nd edition. Pretoria: National Treasury.
- Rao, T.V. & Rao, R. 2014. *The Power of 360 Degree Feedback: The India Way for Leadership Effectiveness*. SAGE Publications India.
- Rasheed, A., Khan, S.U.R., Rasheed, M.F. & Munir, Y. 2015. The impact of feedback orientation and the effect of satisfaction with feedback on in-role job performance. *Human Resource Development Quarterly*, 26(1):31-51.
- Scarborough, D.P., Rama, D.V. & Raghunandan, K. 1998. Audit committee composition and interaction with internal auditing: Canadian evidence. *Accounting Horizons*, 12(1):51.
- Sun, J., Lan, G. & Liu, G. 2014. Independent audit committee characteristics and real earnings management. *Managerial Auditing Journal*, 29(2):153-172.
- Vukotich, G. 2014. 360° feedback: ready, fire, aim – issues with improper implementation. *Performance Improvement*, 53(1):30-35.
- Wang, M.C., Lee, M.H. & Chuang, J.J. 2016. Relations among audit committee establishment, information transparency and earnings quality: evidence from simultaneous equation models. *Quality & Quantity*, 50(6):2417-2431.