



# Griffiths III Technical Report

2021



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## Introduction

The Griffiths Scales of Child Development (3rd Edition; Griffiths III) was published in 2016 by the Association for Research in Infant and Child Development (ARICD) and Hogrefe Ltd and is the most recent version in the long history of the Griffiths Scales (Stroud et al., 2016). Pre- and post-launch, much research and reflection went into the use of this major revision of the Scales. A periodic reflection on the developing research and new information that has expanded our knowledge of the use of the Scales provides an opportunity to consolidate learning. It also allows us to consider research trends and highlight those areas that may form the focus of research in the future. Such is the purpose of the present report and to provide technical evidence of the usefulness of the Griffiths III as a child development assessment tool.

Stroud et al. (2020) reflect on the nature of tests and that test development and revision does not occur within a vacuum. As such, the context in which a test is used, and what the user needs are, should be uppermost considerations in the decisions of development or revision teams. In the revision of the Griffiths III test users identified the need to view children holistically, and for the Scales to provide not only the valuable normative information associated with tests of child development, but to facilitate more in-depth analysis. This need for both “thick” and “thin” descriptions has been a driving force for the Griffiths III, first in its development as a quantitative and qualitative assessment tool, and subsequently in emerging research.

There have been significant or key moments in the development of the Griffiths III. Some of these key moments are showcased in the table below. The tabulated timeline tracks these key moments linked to disseminated research outputs in the lifespan of the Griffiths III to date.

## Key Moments in the Griffiths III Development

<b>Date</b>	<b>Activity</b>
2010	Decision to revise the Griffiths Scales (London, United Kingdom)
2012	Presentation at the International Congress of Psychology (Cape Town, South Africa)  14th International Scientific Meeting of the ARICD (Birmingham, United Kingdom)
2013	15th International Scientific Meeting of the ARICD (London, United Kingdom)
2014	16th International Scientific Meeting of the ARICD (Birmingham, United Kingdom)
2016	ARICD Launch of the Griffiths III (London, United Kingdom)  Presentation at the International Congress of Psychology (Yokohama, Japan)
2017	17th International Scientific Meeting of the ARICD (Birmingham, United Kingdom)
2018	Presentation at the British Paediatric Neurology Association Meeting (London, United Kingdom)  Professional Development Day (London, United Kingdom)
2019	18th International Scientific Meeting of the ARICD  Presentation at the 5th International Congress of Clinical and Health Psychology on Children (Oviedo, Spain)
2020	ARICD Autumn Educational Meeting (Online Webinar)
2021	Online Symposium at the International Congress of Psychology (Prague, Czech Republic)

## Validity Studies

### Validity of the Griffiths III Revision

Revisions of psychological tests are appearing with increasing regularity, with revised editions of popular tests being launched about every 10 years (Adams, 2000). Test revision is a complex process, however, that needs to improve on its predecessor, be mindful of test-user feedback, and advance in line with new research findings and developments in the field of assessment. Cronje (2020a) developed guidelines for the

revision of psychological tests, drawing on guidelines published by notable national and international organisations, such as the International Test Commission, British Psychological Society, European Federation of Psychologists' Associations, and the American Psychological Association. Cronje performed an in-depth analysis of the revision of the Griffiths III against established guidelines (Cronje, Stroud & Watson, In Press), and found a high level of validity and authenticity in the process followed by the revision team.

Whilst some recommendations were made regarding cross-cultural validity and assessing children with special needs, the review concluded that much had been accomplished by the Griffiths III to advance the assessment of children, whilst creating a framework for future growth in fair assessment of child assessment. The Griffiths III revision process was explored by Stroud et al. (2020), detailing the six phases of the revision process and the value of merging quantitative and qualitative information in a test that is designed to be psychometrically sound and quantitatively robust, yet flexible enough to accommodate assessments in different contexts and to create opportunities for qualitative data to emerge.

## Concurrent Validity

Several studies have investigated the validity of the Griffiths III with other measures of child development, including the predecessor of the Scales, the Griffiths Mental Development Scales – Extended Revised (GMDS-ER). Kolver (2015) explored the concurrent validity of the Foundations of Learning subscale, which is a new subscale developed for the Griffiths III, in comparison to the subscales of Performance and Practical Reasoning it replaced from the GMDS-ER. Kolver created a matched sample of 259 children (aged three to six years) to correlate their performance on the different subscales. T-tests found significant differences in performance between these subscales, but also high correlations (.87 and .89). Kolver's findings concluded that, although the Foundations of Learning subscale was unique and different from its predecessors, it retained a strong relationship with them in terms of how children performed on them.

Cronje, Green and Venter (2017), investigated the performance of children between the Griffiths III and the Ages & Stages Questionnaire (ASQ) - 3rd Edition (n=39) and the Wechsler Preschool and Primary Scale of Intelligence (WPPSI-IV-UK) (n=21). These researchers found a good to excellent agreement between the Griffiths III and the ASQ on the classification of children's test performance, indicating a strong positive relationship between these measures. Most correlations were moderate to high. For subscales of the WPPSI-IV-UK, the researchers found mostly high to very high correlations with subscales of the Griffiths III. Only two low correlations were found between the Language and Communication subscale of the Griffiths III and the Similarities (.30) and Vocabulary (.36) subscales of the WPPSI-IV-UK. Two very high correlations were found, however, between Foundations of Learning and the WPPSI-IV-UK subscales of Picture Concepts (.97) and Cancellation (.92).

Whilst Lukens et al. (2021) employed the Griffiths III as part of a battery to determine the predictive validity of the Lacey Assessment of Preterm Infants, their research provided insight into the Gross Motor subscale of the Griffiths III as well. Notably, in a sample of 31 children, no statistically significant difference was found in the identification of motor delay between the two tests. Further research was advised, but the Griffiths III highlighted the sensitivity and specificity of the Lacey Assessment of Preterm Infants, therefore pointing to its value.

The above quantitative research studies indicate good levels of concurrent validity in the Griffiths III. The Griffiths III is, however, not only a quantitatively focussed test but is also rooted in qualitative forms of assessment and research. This is best demonstrated by the various recent case studies that have been published. These are described below.

## Case Studies and Other Related Case Study Research

Stroud and Green (2018), explored the utility of the Griffiths III to track developmental progress in children with complex neurodisability in the United Kingdom and South Africa. This research was important in that it compared progress to the age-linked items in the Griffiths III, thereby opening a pathway for subsequent studies that expanded on our knowledge of qualitative item analysis on the Scales. Since this study, the Griffiths III has appeared increasingly in the literature as part of test batteries to establish baselines, assist in diagnosis and monitor the development of children with a range of developmental disorders and impairments such as Aicardi-Goutières syndrome (Mura et al., 2021), Down Syndrome (Antonaros et al., 2021; Gee & Gee, 2020), Autism (Jansen et al., 2020a), and Brachmann Cornelia De Lange Syndrome (Jansen et al., 2020b). The articles by Jansen et al highlight the qualitative use of the Griffiths III in case studies, and the test's quartile charts that allow for a finer-grained analysis of children's test performance and therefore interpretation of their individual development.

A study by Mishra et al. (2020) used the Griffiths III to establish the developmental age of 40 children with Autism Spectrum Disorder (ASD) against 40 children with typical development. The children were matched based on their developmental age and clinical observation was used to investigate the children's gesture production as a means of communication. The study found that children with ASD produced fewer gestures overall and fewer types of gestures than the control group, which points to restrictive communication and communicative delay. This research effectively used the developmental age estimates of the Griffiths III and furthered our understanding of communicative delay in children with ASD, which has implications for intervention.

Neurodevelopment has become an increasingly important aspect of child assessment. The Griffiths III was used to assess the neurodevelopment of preterm children at 36 months (Fontana et al., 2021). This study demonstrated quantitative improvement in developmental outcomes for children exposed to early intervention, as opposed to standard care. As the Griffiths III can be used repeatedly on a child during early childhood, the Scales make an invaluable contribution to facilitating diagnosis, intervention planning, and monitoring.

Gee and Gee (2020) demonstrated the integration of sources of data within and outside a Griffiths III assessment to increase the ecological validity of the story of the child so as to accurately reflect their cognitive, neurodevelopmental, and adaptive functioning. Gee and Gee argue that doing so increases the predictive validity of the assessment process and facilitates the development of criterion-based interventions and individual education plans for children.

An aspect of test validity is its overall structure, and the ability of items to cluster together in specific factors. Cronje et al. (2021) investigated the factor structure of each subscale of the Griffiths III, focussing on the performance of children in each year on items for that year. The results mostly indicated two to four distinct factors in each subscale for children from years one to four. Interestingly, three factors emerged for each of the subscales in year one. Thereafter, the number of factors varied between subscales in ensuing years. In year five, the variance explained by the analysis was too low for meaningful interpretation, and in year six, the dataset did not meet the criteria for factor analysis. This was expected due to the increasing interrelatedness of developmental domains for older children. It did, however, confirm theories regarding the complexity of child development, and the development team's expectation that, whilst individual test items were placed at meaningful points in the test, children develop along complex and unique pathways that necessitate not only analysis of summative scores, but also of individual item performance.

## Griffiths III Test-User Feedback

User experience has been a key feature of the development of the Griffiths III. The feedback of Griffiths practitioners was instrumental to many decisions taken during the development of the Griffiths III (Samuel, 2014). Samuel reported on the feedback of 85 practitioners that highlighted aspects that were addressed during the revision of the Griffiths III, such as the age range, standardisation information, guidelines to using the psychometric properties when reporting on a child's performance, inclusion of age bands for test items, the length of time to administer the test, assessing children with special needs, calculation of the basal and ceiling, and easier scoring of the test. These areas and others were addressed by the development team, again underscoring the importance of test user feedback.

The value of practitioner feedback in the Griffiths III was explored further by Green et al. (2020), who argued for the importance of practitioner feedback and reviews in the construction of psychological tests. The authors referred to the need for test developers and publishers to foster a relationship with test users, as it is only by understanding the contexts within which tests are used, and what the needs of users and clients alike are of an assessment, that meaningful changes can be made to existing tests in future revisions.

User feedback has been pursued as an avenue for post-launch engagement between test developers and clinicians. Le Roux (2020) reported on feedback from 72 Griffiths III users. Clinicians mentioned the value of the Scales to diagnose neurodevelopmental disorders, as well as for intervention planning and monitoring of children's progress. Clinicians mention, however, the need for further test-linked resources to provide a more accurate picture for children with Autism Spectrum Disorder, and norms for atypically developing children. This feedback highlights the need for a mind-shift in clinicians regarding the purpose of assessment and the outcomes they expect from an assessment (Harvey et al., 2011). In theory, norms can only reflect a population who, by definition, consist of group members that share similar characteristics (De Vos et al., 2014). Specific norms for children with a specific disorder would require a sample of children that only have that specific genetic disorder with no other co-morbidities. This condition for inclusion in the norm sample exists only very rarely in reality, as children with a specific disorder usually present with combination of other genetic, physical, neurological and development challenges, which complicates diagnosis (Florian et al., 2006). Visser et al. (2012) raised similar concerns, and since then the literature has shifted from the traditional biological disturbance paradigm of testing to an ecological paradigm that is more focussed on authentic assessment of children with special needs and specific disorders.

In practice it may be argued that any quotient below 50 becomes subservient to what other information a test session can provide concerning how the specific child functions. The focus shifts from a number to getting a real sense of who the child is, what they are capable of, and what the next milestones for them would be that should form the focus of intervention strategies. This is where the Griffiths III excels in innovation, particularly through the use of the Scales' quartile charts. Returning to the feedback from clinicians (Le Roux, 2020), the ARICD has published additional materials to assist clinicians to make this transition in assessment focus for atypically developing children, and researchers such as Jansen et al (2020a; 2020b) have responded by publishing research for test users, particularly demonstrating the use of the quartile charts in integrative assessments. Additional work regarding case formulation and integrative report writing will be addressed further in an upcoming case study book for practitioners.

## International Validation Studies and Uptake of the Griffiths III

Rodocanachi Roidi et al. (2019) mention the Griffiths III as an important test of child development, but they also reflected on its limitations in capturing the specific movements of Rett syndrome. As with any test, the Griffiths III is limited to its intended purpose as a general test of child development. Given the ever-expanding field of medical knowledge and diagnosis, it would be impossible for a single test to be a diagnostic tool for all developmental disorders. The comments by Rodocanachi Roidi et al. (2019) highlight,

however, the role and value of the Griffiths III in flagging developmental delays early in an assessment process, that could then be followed by tests designed to identify specific disorders.

Mutapi et al. (2021) conducted a study in Zimbabwe on 166 children aged between six and 72 months, particularly looking at stunting and schistosome infections. They found children with stunting to have significantly lower scores in the Eye and Hand Coordination, and Gross Motor subscales of the Griffiths III, as well as in General Development. Furthermore, children with schistosome infections had significantly lower scores in the Foundations of Learning subscale. Six and 12 months after treatment the performance of children had improved to expected normal or above levels in Foundations of Learning. The above studies demonstrate some of the sensitivity and accuracy of the Griffiths III in assessing the development of children, and its usefulness in monitoring treatment.

Since the launch of the Griffiths III in 2016, there has been considerable international interest in the Scales, with regular requests for access to and training on the Griffiths III. The Griffiths III was developed to facilitate translation and adaptation. Validated and translated editions have been published in Portugal and Italy, a translated version in Sweden with more translated versions underway. A French translation is used for research purposes by Institut Lejeune in Paris for their research. In Brazil, a study is underway using the Beaton method (Beaton et al., 2000) for validation of the Brazilian translation. Griffiths III years one and two are completed so far (Ferreira-Vasques, Santos, & Lamônica, 2019).

A Tamil script is completed and scripts in Hindi and Chichewa are underway as part of World Health Organisation (WHO) related research work. This research using scripts is specifically for use in countries where the assessors speak both English and their local language, the use of a script of the verbal instructions to the child translated and validated into the local language is proving a useful way of validating the language used to the child. The above validations use different methodologies but confirm that, if the language aspects are addressed according to the local culture, other items requiring amendment are limited in number.

One reason for this is the inclusivity of the ARICD, and the focus on core skills that are observed during the different milestones of child development globally. As each item is linked to its underpinning construct and its specific level of difficulty in the quartile charts, regional item adaptations can be achieved when needed with relative ease. The ARICD also welcomes such adaptation and translation efforts and actively collaborates with local researchers to develop test versions that are aligned with the original Griffiths III. This enables users of the Griffiths III to communicate the Scales in a way that is meaningful, regardless of the test version they use. It also allows for cross-cultural studies and for researchers to feed into the global understanding of both the test and child development.

## Reliability Studies

### Test-retest Reliability

The benefit of tests of child development is their ability to track the development of children across time. This is particularly useful in clinical settings, but the reality in institutions is that appointments may be shortened, thereby necessitating an assessment to be conducted over more than one appointment. In addition, in larger institutions a child may be seen by different clinicians over time. This requires a strong stability reliability for a test.

The test-retest reliability of the Griffiths III was investigated for 53 children (Cronje et al., 2017). This reliability was established with a time delay of between two and four weeks between a first and second



assessment using the same practitioner to assess children (n=32) and different administrators for the first and second assessment of 21 children in the UK and Republic of Ireland. The test results had very high correlations ranging from .967-.996, which demonstrated the test's exceptional stability over time and regardless of test administrator. Some possible reasons for this are the care that was taken in the test's development to clearly word instructions, visually demonstrate the placement of stimulus materials in the test manuals, the clarity of scoring criteria and the ease of scoring the test. The relatively small sample size of the study was sufficient, however, to demonstrate the test-retest reliability of the Griffiths III and its suitability for clinical work environments.

## Item Gradients

Item gradients refer to "how steeply graded standard scores are arranged in relation to their respective raw scores" (Bracken, 2004, p. 41). Item gradients refer therefore to the increase in standard score (such as quotient) associated with a single increase in raw score. Bracken indicates that child development tests are notorious for having steep item gradients, which means that test interpretations are susceptible to measurement error, as a single raw score difference may impact markedly on the quotient associated with that score. In turn, this results in only a rough estimate of performance, which may not be aligned to the client's or practitioner's needs, particularly if the test is used to track development, assist in the creation of individual remediation programmes, and establish the success of remediation over time.

This anomaly of steep item gradients is not necessarily a fault in test development, as such tests have the difficult task of accurately assessing development in the period of human life when such development happens rapidly. These tests must also accommodate the shorter attention span of children, meaning fewer items that all must carry the test's burden of providing an accurate measurement. Bracken suggests no fewer than three raw score items per standard deviation of quotients.

The item gradients were investigated for the Griffiths III on its development quotient that ranges from 50 to 150 with a standard deviation of 15 points. Following Bracken, this would require at least three test items per 15 quotient points, for the Scales' item gradient to be acceptable. The item gradients were researched both with each norm table and for adjoining months (Cronje, 2019). The reason for considering adjoining months is that a child may be assessed quite close to their next month in age, and the question then arises what the difference would have been if the child had obtained their raw score only a few days later or earlier. Would that dramatically affect their development quotient? The results indicated mostly very good levels of item gradients within each norm table, with the percentage of acceptable gradients between raw scores ranging from 74.0% for General Development to 95.6% for the Personal-Social-Emotional subscale.

The item gradients between adjoining age norm tables were all 100% acceptable except for Foundations of Learning (98.8%). This indicates very satisfactory item gradients. The sources of steeper items gradients were found for months one to three and months 60 to 72. This is due to the smaller number of items children at these ages do, as they reach either their performance ceiling or the end of the test within a fewer number of items than children in the remaining month groups (Cronje, 2019). This indicates that the Griffiths III does not reflect the concerns raised by Bracken regarding item gradients within tests of child development, and that the Griffiths III provides a finer-grained and more accurate performance estimate for most children.

## Test Performance Analysis and Interpretation

### Base Rates and Statistically Significant Differences

It is expected for test results to show fluctuations across subscales, as children would be stronger in some domains than others. Peaks and valleys are common, therefore, in test profiles. This raises the question, however, regarding when such peaks or valleys indicate an exceptional strength or weakness for the child.

Base rates are the percentages of children that have a specific difference in test results across two subscales. The base rates for the Griffiths III were calculated using scaled scores (ranging from zero to 20), looking at the difference between individual subscales as well as general development for children per year group (n=426) (Cronje, 2020b). The developers used the standard cut-off of 10% (Sattler, 1982), meaning that if 10% or less of children had a specific level of difference in two subscale scaled scores, this difference is considered a significant performance difference between the subscales for a child. As the base rate tables are calculated per year group, it makes this calculation more specific for each child being assessed, as development theory indicates faster development in some areas at specific ages.

## Interscale Scatter and the Estimation of General Development

The outcome of significant base rates could possibly be that general development quotients may not be the best representation of a child's overall test performance. This is because a general development estimate tends to arise from a composite score across individual test subscales and is therefore sensitive to a considerable peak or valley within a test profile. One method of determining the suitability of reporting general development scores is to calculate interscale scatter of the individual subscale scaled scores (Kaufman, 1976). This scatter is achieved by subtracting the highest subscale scaled score from the lowest subscale scaled score. Cronje (2020b) investigated the interscale scatter of the Griffiths III on the performance of 426 children in the standardisation sample. It was found that 10% of children had an interscale scatter of eight scaled score points. This means that across the board if the interscale scatter is eight points or more, then general development quotients may not be the best indicator of overall test performance. The author added, however, that the statistics for base rates and interscale scatter are intended to advise clinicians, but not replace their clinical expertise. The reporting of test results is always guided by the purpose of the report, its intended audience, and the overall clinical profile constructed by the clinician regarding the child.

## Quartile Charts and Red Flag Items

In some instances, test scores are insufficient to comprehensively describe a child's performance. It may also not be possible to calculate normative scores, due to the extent or nature of disability a child presents with. The Griffiths III can still be used effectively, however, to provide valuable information on the child's capabilities. The quartile charts were originally developed by Dr Elizabeth Green in 2016, and updated in a Hogrefe publication (ARICD, 2020c). The charts indicate the difficulty level of each item in the Griffiths III. Clinicians can plot the child's item performance on the quartile charts to highlight specific strengths or weaknesses by developmental domain. Examples that demonstrate the value of such plotting have appeared in international journals (Jansen et al., 2020a; 2020b).

In addition to the quartile charts, red flag items were developed (Green, 2018) for Subscale E (Gross Motor). This subscale is particularly useful in identifying delayed development, such as crossing the midline, and flagging future learning disabilities. This adds another layer of analysis that practitioners can use if they suspect developmental delays in a child. The quartile charts and Subscale E item flags individualise the analysis and interpretation of test results. This individualisation is specifically prevalent in Subscale D, Personal-Social-Emotional, and Hogrefe published additional background to the development of this subscale (Lane, 2018). This document introduces this expanded subscale in the Griffiths III by tracking its history in previous test revisions, to ground practitioners further in these three components of child development. The document sheds light on the importance of personal, social, and emotional development in children, which are particularly relevant for diagnostic and treatment purposes. Development in these

areas has become particularly important in recent years, where children must develop in a world that has changed due to the coronavirus pandemic, and in which children must learn to adapt to social distancing, lockdowns, and physical isolation.

## ARICD Statements

The ARICD has issued three statements that concern the assessment of children below a developmental quotient below 50. The first concerns normative scoring and the use of the norm tables for children below a development quotient of 50 (ARICD, 2018a). The document introduces the reader to the normal distribution curve, and how its strengths were applied to the standardisation sample of the Griffiths III to develop the test's norm tables. A question may arise how to use the test for children that perform below the floor of the norm tables. This document provides specific guidance for this, whilst reiterating that the Griffiths III can be used to assess children no matter how far their development levels are below the first percentile. The second statement delves further into the assessment of children below a development quotient of 50 by advising practitioners to use both quantitative and qualitative methods of analysis when forming a clinical picture of children (ARICD, 2018b). This landmark statement by the ARICD became a catalyst for the later research studies described earlier in this report. The third document (ARICD, 2018c) provides guidance to practitioners on how to report developmental age equivalents, and the use of the quartile charts when child performance falls below the developmental age equivalents of the norm tables. These three documents work together to guide practitioners on how to assess children with specific or overall developmental delays.

## Digital and Distance Assessment

The impact on child development because of the coronavirus pandemic was referred to earlier. An impact of the global pandemic has been the delivery of health services and the assessment of clients. The Griffiths III was designed as a method of face-to-face assessment, but lockdowns and restrictions on movement impacted on this mode of assessment in many parts of the world. The Griffiths III has some parental report elements, and items were isolated that could facilitate some level of assessment through parental reports and telehealth-based methods. The Parent Questionnaire: Griffiths III (ARICD, 2020a) allows parents to complete the parental report items of the assessment, whilst the accompanying guide for clinicians (ARICD, 2020b) provides information for test users on how to incorporate the parental report questionnaire in assessment, scoring and reporting. Whilst the Parent Questionnaire was a response as a consequence of the coronavirus crisis, it has proved its usefulness in assessing children over distances, which opens possibilities for assessing children in remote areas or when distance prevents face-to-face interaction between the clinician and child. This questionnaire can therefore be a prototype for continued development in the Griffiths III and an important mode of assessment in the future.

Tablet-based technology has also featured in the assessment modes being explored for the Griffiths III (Marais et al., 2017a; 2017b; 2021). Marais (2020) started with an exploration of digital items for children and developed guidelines for tablet-based assessment, which will be useful in the exploration of digital assessment avenues in the future.

## Summative Reflections

This technical report represents a part of the development and research journey of the Griffiths III since its launch in 2016. The report not only provides an opportunity to pause and reflect on the efforts of many contributors on the test thus far, but to offer some projection into the future of the Scales.

In evidence is the increasing volume of work that has been produced year-on-year by the ARICD, research teams, and individual contributors. The ARICD has been proactive in providing platforms for research collaboration and dissemination over the years, particularly through its International Scientific Meetings.

Statistical studies have considered the validity and reliability of the test, whilst also providing valuable guidance for clinicians as to how to use the test effectively. These studies have used the test's standardisation data optimally and collected additional data on a smaller scale for research into test-retest reliability.

The year 2018 cemented the use of the Griffiths III for children with disabilities with the publication of the ARICD statements and the research by Stroud and Green (2018) on neurodisabilities. Since then, there has been a groundswell of research in the use of the test for children with specific disabilities, and the value of the test as a qualitative tool that can assess child development through item performance. This research has not only taken the test forward but has also advanced the assessment of children. It has added to developmental tests in general by progressively advancing tests from a purely quantitative, normative framework to an individualised qualitative assessment tool, through clear case study demonstrations. An upcoming case study book on the Griffiths III will add immeasurably to this initiative, as it redefines the landscape of child development testing.

The ARICD has also embraced the challenges brought by the current coronavirus pandemic and started innovative work on remote testing and the use of digital modes of assessment. This appears to be a growth point for the test, and testing in general, which bodes well for the future of the Griffiths III.

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